WESTERN GAS

ROBERTSHAW "AutomatiCook"

EXIT
Here is a happy picture for gas range salesmen—a picture that will come true surprisingly often for those who tie up with the Robertshaw fall campaign. Rapid fire advertisements in The Saturday Evening Post—America's greatest selling medium—will send many housewives to every dealer who features Robertshaw equipped gas ranges. CONTROLLED gas is the perfect cooking fuel. Millions of women know it—just as they also know that when they see the Robertshaw name on the dial, their oven cooking is sure to be under perfect control. Be sure your selling plans take full advantage of the Robertshaw campaign this fall.
500 450 400 350 300 250
VERY HOT HOT MODERATE LOW
ROBERTSHAW
PAT. APP. FOR
AUTOMATICOOK

ROBERTSHAW THERMOSTAT COMPANY • Youngwood, Pa.

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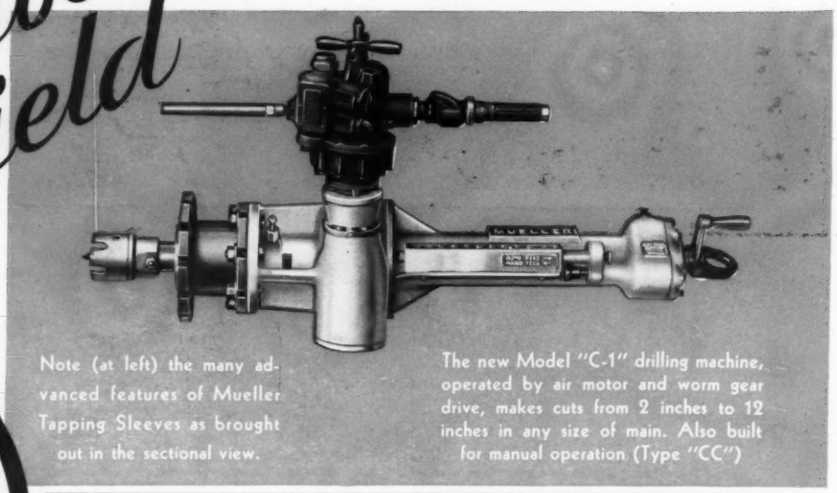
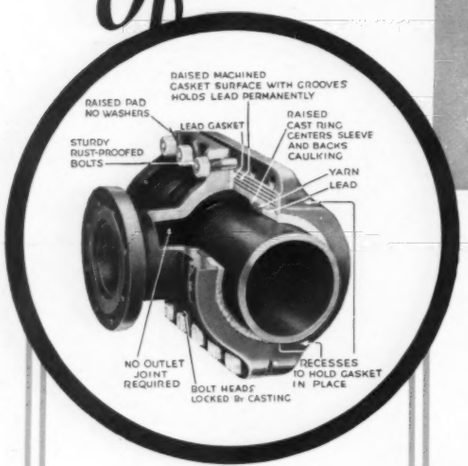
November 1934 ◆ ◆ 25 Cents

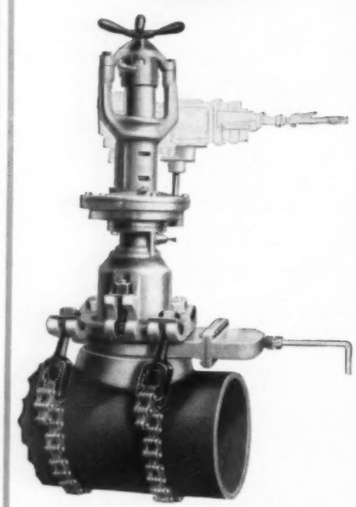
Perfected in the "laboratory of the field"



The new Model "C-1" drilling machine, operated by air motor and worm gear drive, makes cuts from 2 inches to 12 inches in any size of main. Also built for manual operation (Type "CC")


RAISED MACHINED CASKET SURFACE WITH GROOVES HOLDS LEAD PERMANENTLY
RAISED PAD NO WASHERS
LEAD GASKET
RAISED CAST RING CENTERS SLEEVE AND BACKS CAULKING
STURDY RUST-PROOFED BOLTS
YARN
LEAD
NO OUTLET JOINT REQUIRED
BOLT HEADS LOCKED in CASTING
RECESSES TO HOLD GASKET IN PLACE

Note (at left) the many advanced features of Mueller Tapping Sleeves as brought out in the sectional view.



Model "R" Tapping and Inserting Machine for tapping mains and inserting plugs from 2½" to 6" inclusive. Built for either power or hand operation.

WHILE no expense has been spared in equipping Mueller plants for the most exhaustive testing and research, far more important than the laboratory in the plant is that greater laboratory of practical experience wherein Mueller equipment has been so painstakingly conformed to the practical needs of the man on the job.

Everything that is needed to cover the whole range of tapping under pressure from the smallest stop to the largest tapping sleeves and valves is covered by Mueller equipment. The C-1 Power Operated Drilling Machine illustrated above is typical of the most recent Mueller developments in this field. Used in connection with improved Mueller Tapping Sleeves as illustrated, the combination is the most effective ever devised for the range of pressure tapping to which it is adapted. The other Mueller Tapping and Inserting Machines shown opposite are merely typical of the wide range of equipment which includes a time and labor saving machine for every purpose.

This and other Mueller equipment will be exhibited at our Booth No. 301, American Gas Association Convention. If you are unable to see it there, consult your Mueller Catalog H for complete details covering the latest Mueller advancements.

MUELLER CO., Decatur, Illinois

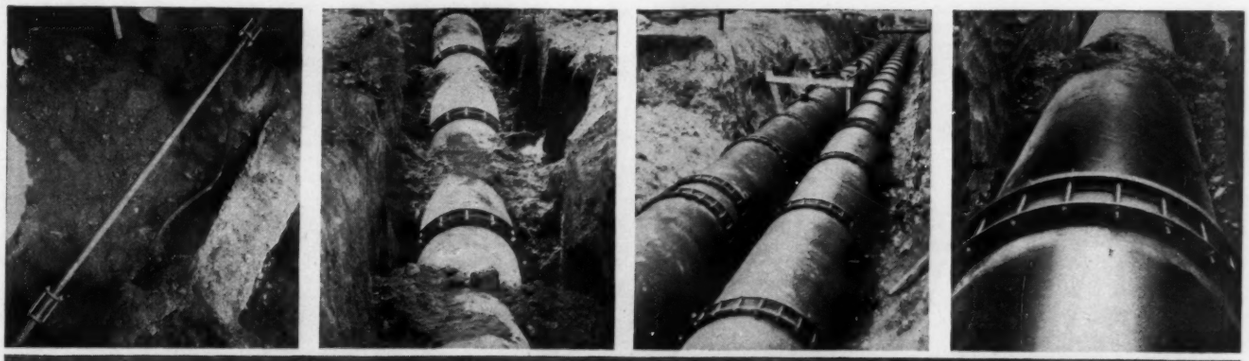
Factories: **Decatur, Ill.; Chattanooga, Tenn.; Los Angeles, Calif.; Sarnia, Ontario**

Branches: **New York and San Francisco**

Visit the Mueller demonstration at Booth 301, A. G. A. Convention, Atlantic City, Oct. 29 to Nov. 3

MUELLER

GAS DISTRIBUTION EQUIPMENT



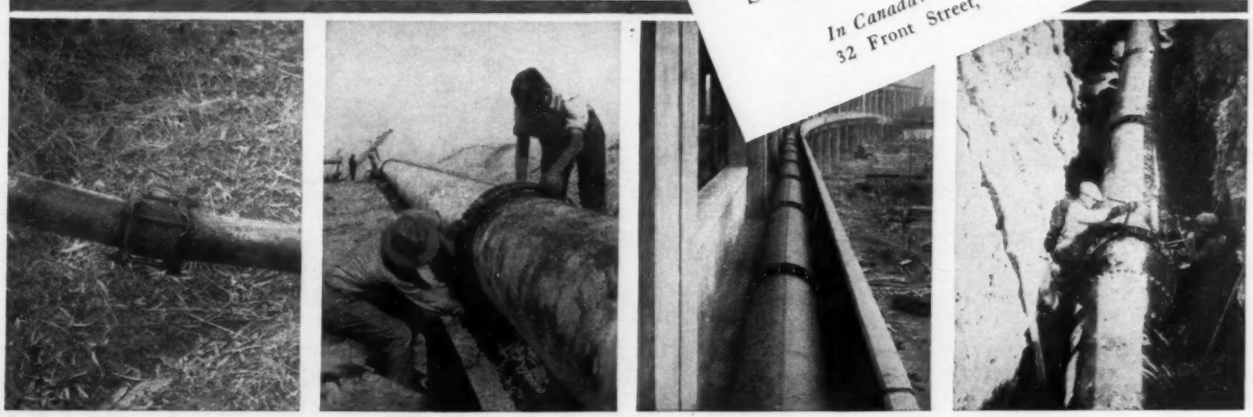
ON LINES OF ALL DIAMETERS

You can have DRESSER COUPLING advantages

FOR 60-inch pipe or 3/8-inch pipe, no other joint compares with a Dresser Coupling. Before you lay another line or main, think of the simplicity, the ease and speed, with which Dresser Couplings can be installed by unskilled labor. Think of the permanence, the freedom from repair, the *absolute* tightness —established by nearly fifty years of proof. Ask us for more details on these outstanding Dresser advantages; they apply equally to all kinds and sizes of plain-end pipe.

S. R. DRESSER MFG. COMPANY
Bradford, Pa.

In Canada: Dresser Mfg. Company, Ltd.
32 Front Street, W., Toronto, Ontario



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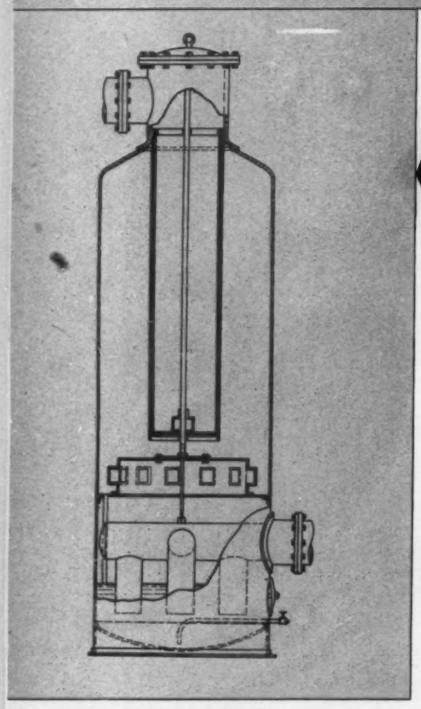
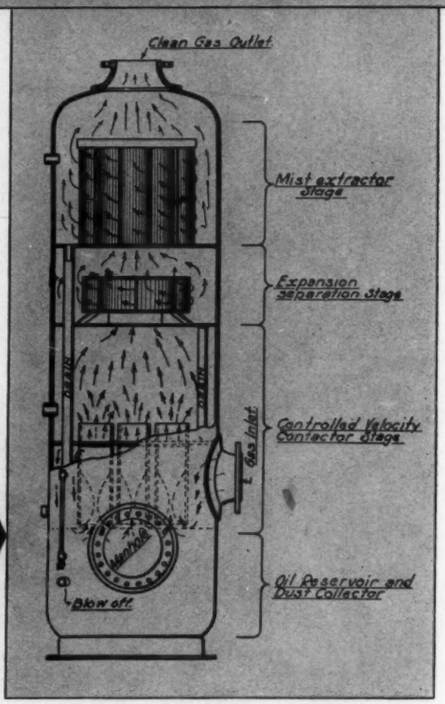
PROGRESS in GAS SCRUBBING



Original Empire Gas Cleaner
Patents Owned by Blaw-Knox Company

The original Empire Gas Scrubber was good at the time because there was nothing better

The development of the present day Blaw-Knox Gas Cleaner from the old Empire fundamentals was the dawn of a new era in Gas Scrubbing



Improved Blaw-Knox Gas Cleaner
(Patented)

ELABORATE and painstaking research and experiment in both field and laboratory, has resulted in the evolution of the Empire Gas Scrubber to the finished and highly perfected mechanism represented by the 1934 Blaw-Knox Gas Cleaner. Blaw-Knox Gas Cleaners offer a profitable investment for the distributor of natural or manufactured gas and the transmission line operator. They insure continuity of service, reduced maintenance and increased customer satisfaction.

Some advantages of the BLAW-KNOX GAS CLEANER

Higher capacity per unit size.

Lower pressure loss at full load.

Pressure loss constant throughout life of equipment. No screen to clean.

Major portion of dust settled and taken entirely out of gas stream.

Practically no oil loss. Large reservoir capacity.

Absolutely non-clogging with large flow areas.

Let us show you specifically what we can do for your conditions.

BLAW-KNOX COMPANY
2016 Farmers Bank Bldg. Pittsburgh, Pa.
Offices in Principal Cities

BLAW-KNOX GAS CLEANERS

"Better satisfied with this pipe than any we have ever bought"*

Less than two years ago the first length of Super-de Lavaud Pipe was "cast without chill in a metal mold." Since then we have made and sold *more than seven million feet.* Users like this pipe to the point of enthusiasm, as evidenced by comments such as the one quoted in the headline of this advertisement. They find it tougher, stronger, more ductile, and that, with ordinary care, breakage is almost unknown. Doubled impact-strength gives this pipe powerful inherent protection against damage from shocks encountered in transportation, handling and laying. These advantages are made possible by the patented Super-de Lavaud process in which the pipe is *cast without chill in a metal mold.* For further information, write for booklet.

UNITED STATES PIPE AND FOUNDRY CO.
BURLINGTON, N. J.

Foundries and Sales Offices throughout the United States

*From statement of user in our files.

U.S. SUPER-DE LAVAUD PIPE

IMPACT RESISTANCE INCREASED MORE THAN 100%

"Here's Why OUR 1500 H.P. UNIT IS MORE ECONOMICAL"

● Have you a compressor requirement of 1500 H. P.? You can *save* with this twin-tandem unit. It occupies approximately the same space as a standard 1000 H. P. Cooper-Bessemer unit. That means a lower cost per horsepower for building, concrete and crane. Also the weight per horsepower is less — saving you money in freight, unloading, and erecting. Type-26, in fact, can be erected as quickly as Type-22.

Type-26 follows the same design as Type-22 except that all parts are larger and stronger. Consequently there is nothing in the design that has not been thoroughly field tested by thousands of horsepower which have been pumping the nation's gas, in some cases for as long as a quarter of a century.

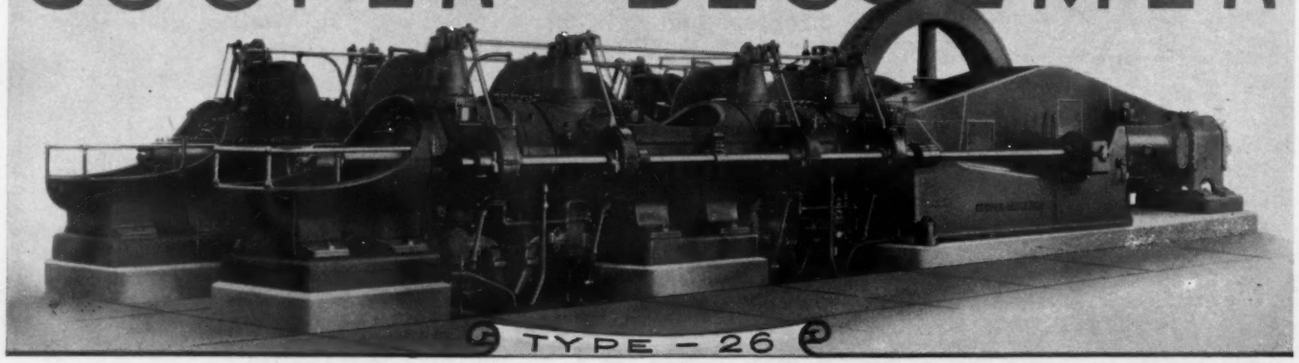
Do not confuse this economical 1500 H. P. unit with the longer stroke, slower speed, heavier and more expensive engine-compressors of long ago. Let us send you its thoroughly modern specifications.

THE COOPER-BESSEMER CORPORATION

Mt. Vernon, Ohio — PLANTS — Grove City, Pennsylvania

201 East 1st Street, Tulsa, Oklahoma
1314 Magnolia Building, Dallas, Texas
25 West 43rd Street, New York City
225 Crockett Street, Shreveport, La.
505 Esperson Building, Houston, Texas

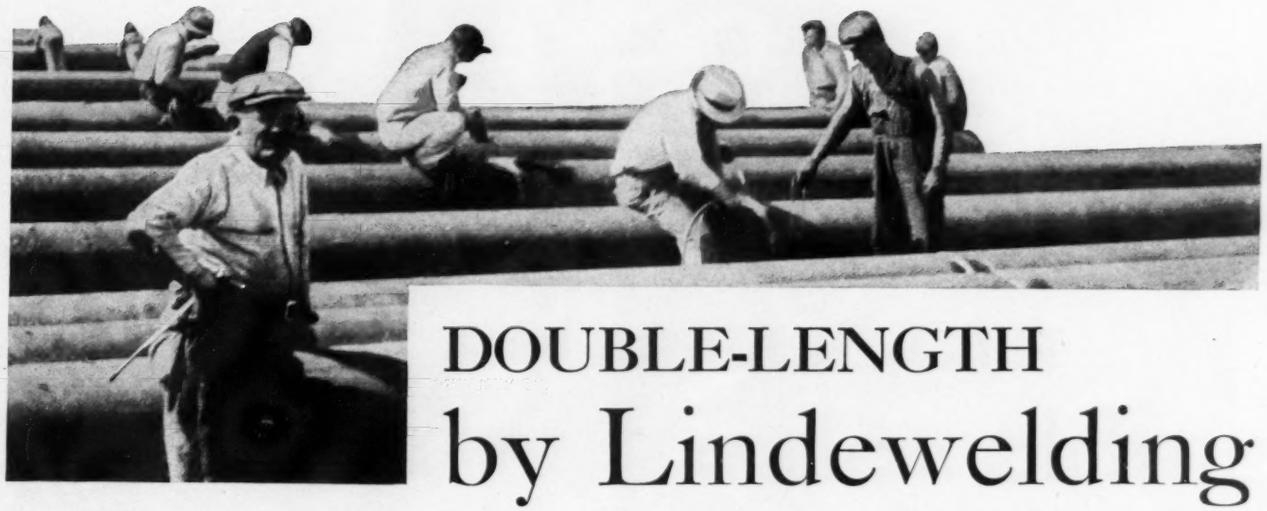
COOPER-BESSEMER



TYPE - 26

YOU CAN ORDER EVERYTHING FOR PIPE LINE LINDEWELDING FROM LINDE

when Time Counts



DOUBLE-LENGTH by Lindewelding

PUTTING back to work, on a new location, about 65 miles of abandoned pipe line, was the problem faced by a Linde customer. To do the job in the shortest time—and at the lowest cost—Linde Service men were called in. They specified Lindewelding because of its inherently greater speed and superior quality of the joints over other types.

To gain time, the pipe was double-lengthed by Lindewelding at the pipe racks. This cut the number of welds required on the firing line *just in half!* Speed—and more speed—developed with each day's work. The number of welds made per day increased progressively. Yet—less gas was consumed. Fewer rods were used than by other methods and—*all welds were sound.* With production "clicking" like this, the pipe line was laid fast, even under extremely muddy conditions.

Here was a job that fully sold the customer on Lindewelding reclaimed pipe. It made performance mean something. Results were so economical in both time and materials that all this customer's future pipe line construction will be Lindewelded.

Linde Process Service supplied without charge to Linde customers includes assistance in organizing pipe line construction operations for greatest speed, dependability and profit. Linde Engineers have had wide experience in double-lengthing operations in pipe mills and in field operations all over the country.

Multi-Flame Head for Lindewelding is setting new records for fast production on pipe lines

Take advantage of Linde's offer to help. You will profit from the experience and knowledge of a great organization of laboratory workers, engineers, and service engineers—all, at no extra cost. Call freely on the nearest Linde Sales Office to tell you how they can help in your pipe line construction work.

PRODUCT OF A UNIT OF UCC UNION CARBIDE AND CARBON CORPORATION

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

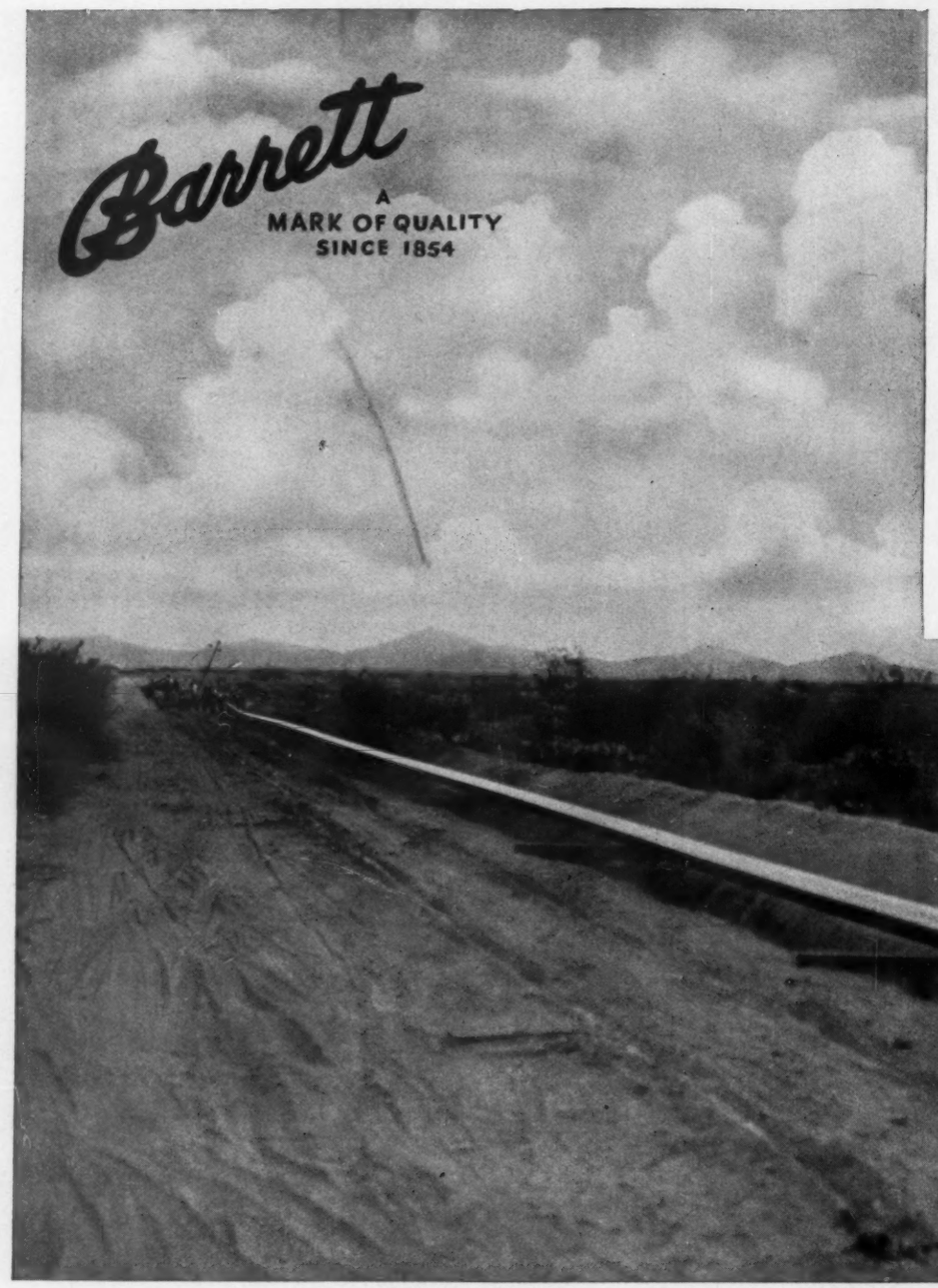
NRA CODE

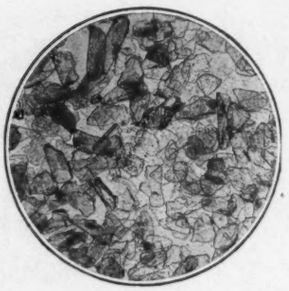
UCC

Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Butte Chicago Cleveland Dallas Denver Detroit El Paso Houston Indianapolis Kansas City Los Angeles Memphis Milwaukee Minneapolis New Orleans New York Philadelphia Phoenix Pittsburgh Portland, Ore. St. Louis Salt Lake City San Francisco Seattle Spokane Tulsa

IN CANADA, DOMINION OXYGEN CO., LTD., TORONTO

LINDE OXYGEN ▪ PREST-O-LITE ACETYLENE ▪ OXWELD APPARATUS AND SUPPLIES ▪ UNION CARBIDE





Reproduction of the micrograph above shows the interlocking of the flakes of the internal reinforcement used by Barrett. By laminating with the waterproofing agent they give Barrett Pipe Enamels unusual toughness and resistance to soil stresses.

For pipe of large diameter, The Barrett Company will furnish equipment required to revolve pipe and spread enamel.

BUILT on 80 Years of Waterproofing Experience

Barrett Specification

PIPE LINE ENAMELS

Metal pipe will last years longer and have greater immunity to aging and corrosion when it is protected with Barrett Specification Pipe Line Enamels. Moisture-proof and not affected by earth acids. Barrett Specification Pipe Line Enamels are also non-conductors of electricity. They provide a smooth, tough film which gives extraordinary resistance to mechanical injury and to corrosion and electrolysis. Behind Barrett Specification Pipe Line Enamel stands eighty years of experience in the development and application of coal-tar protective coatings. Barrett offers the cooperation of its Technical Staff and the service of its Field Engineers for developing special protective coatings and efficient methods of application. 'Phone, wire or write for further information.

THE BARRETT COMPANY **40 Rector Street, New York, N. Y.**

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WESTERN GAS

"Reg. U. S. Pat. Off."

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District Offices: 1064 Peoples Gas Building, Chicago; 447 Sutter Street, San Francisco

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JAY JENKINS, Publisher, GEORGE H. FINLEY, Editor, CRAIG ESPY, Mid-Western Manager
OFFICIAL PUBLICATION, Pacific Coast Gas Association; Southern California Meter Association

WM. MOELLER, Jr.—President, Pacific Coast Gas Association; elected at the Del Monte convention in October. The new P.C.G.A. chief is vice-president of the Southern California Gas Company, Los Angeles, in charge of gas production and transmission. He is also nominated for the A.G.A. Natural Gas Department vice-chairmanship to serve during the coming year.

November, 1934

WESTERN GAS

"Reg.U. S. Pat. Off."

Vol. X, No. 11

A Monthly Journal of the Gas and Gas Appliance Industries in *Western America*

Tie In *with* Better Housing

Presenting Several Gas Company Programs for Capitalizing on the Federal Housing Administration Campaign

IN the past two issues *Western Gas* has directed attention to the expanding activities of the Federal Housing Administration, urging gas utility new business departments to avail themselves of the many opportunities existing under this program to translate the liberal loan provisions into gas equipment sales.

Indicating the proportions to which a nation-wide better homes movement might grow, Federal estimates place the number of homes needing repair at 13 million. Properly organized, the movement may well compare with the wartime Liberty Loan drives in its general acceptance.

By this date it may be assumed that new business departments generally are familiar with details of the F.H.A. plan, under which unsecured loans are available for building improvement. Since it now is definitely ruled that any gas appliance connected with piping may qualify for financing under these insured loans the opportunities for new sales, both directly and through encouraging dealer outlets to use the F.H.A. facilities, may be found on every hand. The biggest element of sales resistance is removed in this liberalizing of credit.

With the F.H.A. program now in motion *Western Gas* last month addressed an inquiry to a number of leading gas companies, asking them what steps they are taking to tie-in. Without exception the replies indicate intense interest in the possibilities, though a majority of companies report that their programs are still in the formative stage.

However, a few companies which are in the vanguard and have already initiated complete tie-in programs, have responded with details which will be of interest to the industry. Special mention is made below of the work inaugurated by the Pacific Gas and Electric Co., Public Service Co. of Northern Illinois, Peoples Gas Light and Coke Co., and The Brooklyn Union Gas Co.

Pacific Gas and Electric Co., San Francisco, was one of the very first in the field with a thorough-going tie-in plan, instituted under the direction of R. E. Fisher, vice-president in charge of public relations and sales. H. M. Crawford, P. G. and E. sales manager, gives us the following summary:

A message from
Mrs. Anna J. Peterson
to the Housewives of Chicago
Kitchen and Basement
Planning Bureau
KITCHEN AND BASEMENT PLANNING BUREAU
THE PEOPLES GAS LIGHT AND COKE COMPANY

The Peoples Gas Light and Coke Co. ties in with Better Housing in this advertisement, issued October 12.

P. G. AND E.'S 10-POINT PROGRAM

"The company's first move was to get out to all its 500 sales people, managers and key men an informative bulletin outlining the principal features of the housing program and illustrating many ways by which it could be utilized in the promotion of gas business, particularly in the domestic and small commercial classifications. This informative bulletin stresses the importance of getting over our story to the borrower before he completes his plans for modernizing his home; otherwise he might expend all his loan for other features in the home and forget all about the more essential features such as a modern gas furnace, a modern automatic gas water heater or a modern gas range.

"Since issuing these informative bulletins to all sales people we subsequently learned that the installation of gas ranges could be financed under the provisions of the Housing Act so it probably works 100 per cent for the promotion of gas sales in the domestic, commercial and industrial fields. Where a range, circulating heater, water heater, conversion burner or other heating appliances cost less than $100 installed, the single appliance could not by itself be financed under the plan as loans are limited from $100 to $2,000. In these cases it is planned to have the borrower put in two or more load-building appliances, bringing the total loan to over $100 and thereby coming within the provisions of the Act. In case only one load-building appliance is needed by the borrower and the total cost is less than $100, then it is our plan to suggest to him that he do some other modernization work in his home which will bring the total cost to over $100.

"In order to take prompt action and to gain fullest advantage of the provisions of this Act, we secondly issued instructions to our 12 divisions that they immediately contact the local banks and become fully acquainted with all phases of the plan. It was also ordered that steps be taken within the organization in each division to promptly educate the sales personnel concerning all the features of the Government plan, suggesting that group meetings be held.

"There is no question but what the modernization credit plan is by far the lowest carrying charge ever offered for installment sales of the kind regularly made by utilities. An added feature of the Government plan is that it permits the utility to actually make a cash sale, as the bank pays the utility the full amount of the cost of the installation when completed. The borrower makes his payments directly to the bank in accordance with provisions of his contract, running anywhere from one year to five years. All our salesmen have been urged to take full advantage of the liberal financing plan authorized under the Act in selling gas load building equipment. Our salesmen were likewise requested to become familiar with the personnel of the banks handling housing loans and to assist prospective buyers in making applications for loans.

"Our division organizations were also ordered to cooperate with local trade groups and other community groups organized to promote modernization work.

"Our third step was to organize and set up special window and floor displays for the entire month of October in all our 77 district offices in Northern California. These will especially feature an exposition of load building appliances tying in with the Government modernization plan. These displays employ the national colors, red, white and blue, and will be accompanied with cuts of smiling Uncle Sam at the most conspicuous points. The insignia of the general housing program has also been made up in large circular cards in the national colors. In each of these circular insignias there is an electric lamp to give the impression of lighted windows in the housing insignia home. Some few of these lamps are equipped with flashers to attract attention.

"The effect of using the national colors is very striking; the red, white and blue panels used on the columns in the offices and for backing up electric appliances has been so impressive that we are wondering why these beautiful colors have not been used more often. From each of the insignia are hung cords also in red, white and blue, appropriately stretched to individual gas appliances, which lends a very attractive over-all appearance to displays.

"Our fourth step was to utilize a full page in our P. G. and E. Progress paper, discussing the many features of the National Housing Act. This paper has a circulation reaching 550,000 of our customers.

"The fifth part of our program consisted of placing a very attractive bill sticker on some 600,000 gas and electric bills going to our customers during the month of October. This bill sticker was also made up in the national colors carrying the theme of the National Housing Program and of smiling Uncle Sam appearing thereon.

"The sixth step was to promote a window and floor display contest featuring the modernization plan among the dealers in our territory during the months of October and November. We will award a prize of $100 for the best display in each major territory. This should stimulate considerable competition among dealers in the matter of displays and in so doing will afford an excellent tie-in to assist in the promotion of the modernization plan generally.

"The seventh phase is a cooperative program with the Gas Apliance Society for the promotion of better housing among gas appliance dealers in our territory.

"The eighth item in our promotion consists of the distribution of some 250 specially designed posters to dealers in our territory who are equipped with standard poster frames. This is a regular service. The poster is designed also in the national colors featuring the insignia of the national housing program and will carry the message of the modernization credit plan and the statement "Let Uncle Sam Help You Buy."

"The ninth part of our program includes participation in local programs all over Northern California. One of the programs of special interest coming under this part of our general plan is the moving of an old home into the downtown area of many of the cities in our territory. These homes are modernized in the daytime and under flood lighting at night. They are in full view of the thousands of shoppers each day, with the whole community interested in their progress. There will also be many other special activities of this nature to which we will give special attention and assistance.

"The tenth and one of the most important activities on our schedule is a cooperative advertising program among the dealers in our territory. In this connection the company has offered to pay 1/3 the cost of any advertising on gas load-building appliances in our territory, which advertising carries the theme of the modernization housing program. Our gas contribution in this regard is limited to $2,000 but will have the effect of producing $6,000 worth of advertising. The newspapers have been advised of this plan and of course will be very active in soliciting tie-in advertising, as it practically permits them to sell advertising space at 2/3 the regular cost to the merchant. Our own regular advertising will also carry the theme of the modernization housing program.

"Our entire program is divided into 10 parts but each step really happened in rapid fire succession and the program should be considered as one well-rounded plan. Our president, A. F. Hockenbeamer, has received a letter of appreciation from J. A. Moffett, the Federal Housing Administrator,* for the activities we are carrying on in cooperation with the above housing program."

PUBLIC SERVICE OF NO. ILLINOIS PLAN

Public Service Co. of Northern Illinois, Chicago, in a statement signed by Britton I. Budd, president, has outlined an organization scheme for cooperation with Federal Housing Administration officials and local sponsoring agencies throughout its territory. Ground covered by this plan is set forth in the outline below, furnished through the courtesy of Howard East, vice-president of the company:

1. A member of the general office staff will be designated as the F.H.A. Coordinator for the company. His duties will be to keep the company informed concerning the activity, cooperate with divisional organizations in promoting company participation, and to coordinate our efforts with those of national, regional and state F.H.A. organizations.

2. Each division manager will appoint an individual as Division F.H.A. Advisor. The duties of advisor will be to keep employees informed and encourage their cooperation and to generally assist the division manager in housing matters.

3. An announcement to be issued over the signature of the president indorsing the Federal Housing Program and urging the cooperation of all company employees.

4. Each employee to be provided with literature and information concerning the housing program, its aims and purposes. It will be suggested that employees give consideration to making needed repairs in their own homes.

5. The company will give consideration to repairing or rehabilitating its buildings and substations where necessary.

6. Posters with the F.H.A. emblem and statement *"We are Cooperating"* to be displayed in all public offices and stores of the company.

7. Company advertising will, wherever practicable, include a cut of the F.H.A. emblem and statement that the company is cooperating. Advertising featuring wiring, air conditioning, house heating, etc., to specifically mention the F.H.A. angle of such improvements.

8. Window displays will from time to time be featured with reminders of the housing campaign.

9. Company trucks to carry F.H.A. posters (100 company trucks are now carrying a 1½ by 4-foot banner).

10. Local representatives of the company to be encouraged to take part in the activities of local committees when formed and to advocate the formation of such committees where none have been formed.

11. F.H.A. emblems and housing publicity items will regularly appear in employees' paper "The Public Service News" and "Customers' Service Bulletin" mailed to all customers with their monthly bills.

12. Talks on the F.H.A. program, its progress and purposes to be presented before employee meetings and the program will be mentioned at other employee gatherings where practicable.

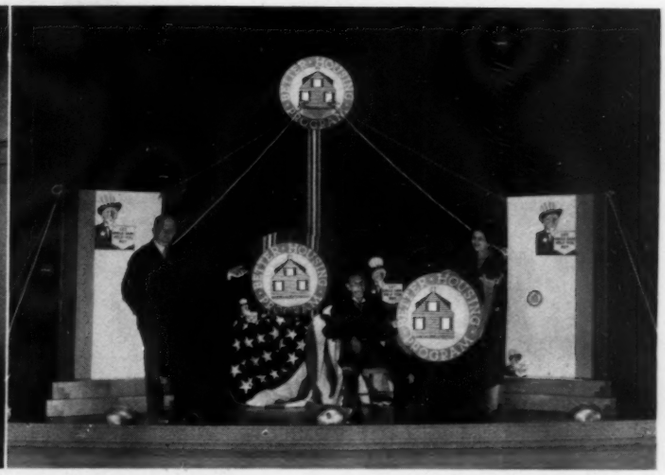
13. Projection equipment to be furnished for use of local campaign committees holding community gatherings.

14. Visomatic records and films prepared by F.H.A. explaining the activity to be obtained and used to sell the plan to the public.

15. Speakers to be supplied to discuss the housing program when requested to do so by local campaign committees or State Director of F.H.A.

16. Check lists to be prepared and distributed for use in appraising the condition of houses and other buildings. These lists

*Editor's Note: In acknowledging receipt of requested information on the P. G. and E. cooperative work Mr. Moffett stated that this program is proving of assistance as a guide for planning many similar efforts.



AT THE LEFT above is reproduced one of the current Better Housing Program windows of P. G. and E. at the San Francisco division office.

BETTER HOUSING activities were featured at a get-together meeting of the Northern California gas industry, held in the P. G. and E. auditorium at 245 Market Street, San Francisco, on September 21. In the view at the right George Egleston (left), then president of the Pacific Coast Gas Association, and H. A. Saxe, president of the Gas Appliance Society of California, are seen on the platform calling attention to the Better Housing Program insignia.

will be supplied to customers with suggestion that they be used to check home needs.

17. Newspapers in territory to be furnished with publicity material bearing on better housing and the Federal Housing program.

18. Company to cooperate with local campaign committee in every feasible manner.

NEW BUREAU SERVES PEOPLES GAS

In Chicago The Peoples Gas Light and Coke Co. is turning its Better Housing cooperation into an appropriate channel. The company for some months has operated a "Kitchen Planning Bureau," which with the advent of the F.H.A. program has been broadened into the "Kitchen and Basement Planning Bureau." An early issue of *Western Gas* will present a description of this Bureau's function and organization, by its director, Harry Swenson. In the present connection it is pertinent to note that the Bureau is the clearing house providing information on how to obtain a building improvement loan, as well as expert advice on modernizing kitchens and basements.

Its staff has available for the customer information on materials and names of qualified firms and contractors. A series of visual exhibits embracing all appliances and materials recommendable for kitchens and basements is now being prepared under Mr. Swenson's supervision. The Bureau's services are being advertised to company patrons through newspapers and by other means, with specific reference to information supplied by the Bureau on building loans.

BROOKLYN UNION'S PROGRAM

One of the earliest among the metropolitan companies on the east coast to get into the field with its housing program is The Brooklyn Union Gas Co. Hugh H. Cuthrell, manager of the new business department, gives *Western Gas* the following comments:

"'What You Can Do With Your Property Modernization Loan' is the title of a four-page folder which The Brooklyn Union Gas Co. has sent out to customers, dealers and employees in connection with the campaign started as a result of the Federal Housing Act.

"This advertising piece is being sent to one-family houses in a selected territory. In addition copies are at all cashiers' counters and on all sales floors so that persons who come in to pay their gas bills or inspect appliances can obtain them.

"The circular informs the customer that gas appliances, if made part of the realty, can be purchased with a Property Modernization Loan. It also suggests that the customer telephone the company should he or she want additional information.

"These calls will be referred to employees who have been instructed in handling this matter. It is thought that in many cases these calls may result in valuable leads to appliance prospects. We will obtain the names and addresses of people who are interested in modernizing their property. If the information we receive appears worthwhile and there are gas-burning appliances involved, the name, address and necessary facts are turned over to the sales department. This makes for prompt action by our salesmen in getting to prospects and making a sale before competitors do so.

"Previous to sending out the above-mentioned folder we sent to our dealers copies of the National Housing Act folder which was published jointly by Time and the Architectural Forum. This describes the background, provisions and possibilities of the Act. Together with it we sent a letter urging the dealers to see their customers and explain the National Housing Act with a view to obtaining gas appliance sales.

"At the time the decision was given that gas appliances, if made part of the realty, could be purchased under a National Housing Act loan, we were completing a survey of the refrigeration and water heating equipment in the 274,947 one- and two-family homes in our territory.

"This information was obtained by the company's meter readers who have entree to the customer's home and can thus obtain more accurate information than any other agent. In order not to interfere with the regular duties of these meter readers, they have been assigned only a limited number of homes to survey each month. They are also compensated when a gas refrigerator or water heater is sold in a home which they have surveyed.

"To collect this data printed forms were inserted in the meter reader's book. These forms contain the name and address of the customer as well as the type of home (one- or two-family). An initial designates in which of the branch districts the home is located. There is space for the meter reader to check the type of refrigeration or water heating equipment the customer posesses. This report is signed by the indexer.

"This information is transferred in punch code to another form card. By means of the mechanical tabulating equipment the second form cards are sorted by kind of appliance and the corresponding fuel and into various fuel combinations of the two types of equipment being surveyed.

"There are nine of these various combinations. Each of these combinations has a different colored card, on which appears the name and address of the prospect, to enable salesmen and the advertising force to know at a glance the appliance equipment of the prospect. These divisions are as follows:

Prospect's Appliance

1. Coal Pot and Ice Box.
2. Coal Pot and Electric Refrigerator.
3. Coal Pot and Gas Refrigerator.
4. Side Arm Gas Water Heater and Ice Box.
5. Side Arm Gas Water Heater and Electric Refrigerator.
6. Side Arm Gas Water Heater and Gas Refrigerator.
7. Automatic Gas Water Heater and Ice Box.
8. Automatic Gas Water Heater and Electric refrigerator.
9. Automatic Gas Water Heater and Gas Refrigerator.

(Continued on Page 34)

A Review of Cathodic Protection *of* Pipe Lines

By A. F. BRIDGE

*Vice-President in Charge of Operation, Southern Counties Gas Company**

DURING the past two years several papers have been written on the subject of cathodic protection of pipe lines against soil corrosion, in which the underlying theory has been fully presented. In this paper I have attempted to review some of the problems, both mechanical and economic, which have been encountered in the application of this method to gas transmission lines.

A. F. Bridge

Cathodic protection has been successfully employed in the Gulf Coastal section for several years, notably on the mains of the New Orleans Public Service Co. and the Baton Rouge-New Orleans line of United Gas System. These pipe lines are located in soils where the water table is usually close to the ground surface, thus causing active corrosion of unprotected steel structures. The severity of corrosion, low soil resistivity, and, in some cases, the difficulty of obtaining a protective coating free from imperfections, in marshy country have favored the adoption of electrical drainage, since it apparently provides a means of arresting corrosion.

In Southern California, corrosive soils are also quite prevalent, but water-saturated soils are the exception, and the corrosivity of the soil varies widely within short distances. In general the soils are good in the mountainous areas, and bad in the coastal plain, except in sections which are sandy and well drained. As a result of these conditions transmission lines installed in recent years have been protected by various coatings conforming in cost and effectiveness to the corrosivity of the soils traversed, which is determined in advance of construction.

In considering the application of cathodic protection to such lines it is therefore necessary to study each section separately. Differences in the electrical resistance of the coatings, and difficulties encountered in obtaining low-resistance grounds in dry soils, cause con-

*Presented on the program of the Natural Gas Department, American Gas Association, at Atlantic City, October 29, 1934.

TABLE NO. 1. VARIATION OF COATING RESISTANCE WITH AGE AND MATERIAL

Location	Length Miles	Reported By	Pipe Diam. (In.)	Description of Coating	Soil Type	Soil Resistivity Ohm Cm.	Change of Coating Resistance With Age—Ohms per Sq. Ft. Initial	1 Mo.	3 Mo.	1 Yr.	2 Yrs.	3 Yrs.	Various
New Orleans	0.5	Kuhn	12	Asphalt primer 2 layers asphalt impregnated asbestos felt	Clay	825	27,710	.....	3,145	1,521	1,300±	.....	
New Orleans	0.6	Kuhn	6.12		Sandy silt	.....	142,200	47,200	39,600	.....	.....	.....	
New Orleans	1.2	Kuhn	10	applied hot	Sandy silt	.....	.....	.....	.....	.....	.....	4,000	
San Clemente, California	1.5	Hough	12	Asphalt primer Cut-back asphalt Osnaburg Cut-back asphalt	Black adobe	.....	.....	.....	.....	.....	.....	.....	134 at 4 yrs.
Laguna, Calif.	6.4	Hough	12	Coal-tar primer 2 coats coal-tar enamel & asbestos felt wrapper	Sandy clay	2,000	10,000,000	.....	.....	44,200	16,300	.....	
Laguna, Calif.	4.8	Hough	12		Sandy clay	1,800	10,000,000	.....	.....	17,260	15,700	.....	
Newport, Calif.	Spot test	Hough	8	Grease, asbestos felt wrapper & hot asphalt	Sand	10,000+	.....	.....	.....	5,020	.....	.....	
Orange County, California	Spot test	Hough	8	Asphalt emulsion Osnaburg crash & hot asphalt	Sandy loam	3,000	.....	.....	.....	.....	.....	142	
Buena Park, California	Spot test	Hough	3	Grease, cotton wrapper & grease	Adobe	1,200	.....	.....	.....	.....	.....	.....	16 at 4 yrs.
Ventura, Calif.	2.4	Hough	12	Asphalt primer 2 coats asphalt	Sandy loam	2,000	.....	.....	.....	.....	.....	.....	300 at 9 yrs.
Ventura, Calif.	2.5	Hough	12	Asphalt primer 2 coats asphalt	Sandy clay	2,500	.....	.....	.....	.....	.....	.....	450 at 9 yrs.
Ventura, Calif.	0.6	Hough	6	0.2 miles Asphalt primer 2 layers asphalt impreg. rag felt. 4.0 miles grease, asbestos felt & hot asphalt	Sandy loam	2,000	.....	.....	.....	.....	.....	912	
Ventura, Calif.	0.6	Hough	15	Coal tar paint, cold	Sandy loam	2,000	.....	.....	.....	.....	.....	.....	42 at 6 yrs.
Oxnard, Calif.	0.2	Hough	6	Asphalt primer 2 coats hot asph.	Heavy black loam	460	.....	.....	.....	.....	.....	.....	430 at 9 yrs.

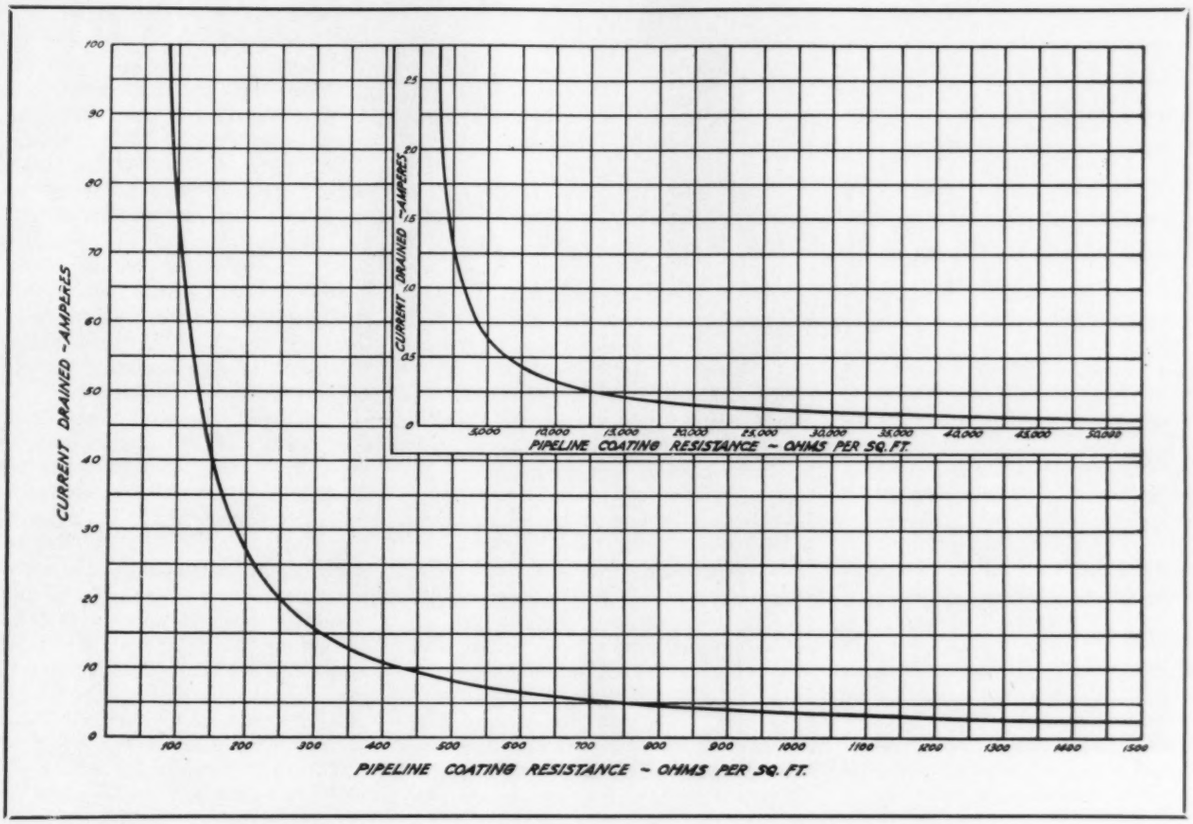

CURRENT DRAINED - AMPERES
PIPELINE COATING RESISTANCE - OHMS PER SQ. FT.
CURRENT DRAINED - AMPERES
PIPELINE COATING RESISTANCE - OHMS PER SQ. FT.

FIG. 1. Graph showing current required to produce a 0.2 volt reduction in "pipe line to soil" potential at the extremity of 1-mile sections of 12-¾-inch O.D. pipe line having various coating resistances.

siderable variation in the per-mile cost of electrical drainage, as will be shown later.

In my opinion, the ultimate success, from an economic standpoint, of this method of protection will depend on the answers to certain fundamental questions, and apparently experience is as yet insufficient to provide definite answers to all of them. These questions, together with a discussion of the available evidence, follow.

1. Does electrical drainage effectively prevent soil corrosion of metallic sub-structures?

2. Will the application of potential and resultant current flow shorten or prolong the useful life of pipe coatings?

3. Even though pipe coatings are unaffected by drainage, will their electrical resistance decline, due to water absorption or mechanical breakdown, until increasing energy costs make continued drainage prohibitive, and if so, how rapidly will it proceed?

There is ample evidence from a number of sources to answer Question 1 definitely in the affirmative. Results reported by Messrs. Kuhn, Thayer, Schneider, and others, covering tests made in Louisiana, Texas, and California, show conclusively that if pipe is maintained at a negative potential of 0.3 volts or more relative to surrounding earth, corrosion is arrested. Galvanic potentials of appreciable magnitude are known to be created by several causes, including mill scale and inequalities in air and/or moisture content of soils in contact with the pipe metal, and it is theoretically possible that counter electromotive forces might thereby be set up which would partially or completely neutralize the impressed negative voltage at certain points on a pipe line subjected to drainage. However, field experience indicates that in practice such interference is unimportant, presumably because the potentials due to these causes are of insufficient magnitude.

The evidence bearing on Question 2 is somewhat incomplete and conflicting. Engineers who have had considerable experience with electrical drainage report that they have observed no damage to coatings on drained lines, which could be attributed to current flowing onto the pipe. In contrast to these reports are the results of a series of laboratory tests recently conducted in California by A. B. Allyne, in which the bond between bituminous coatings and steel was destroyed in from 22 to 82 days when embedded in water-saturated corrosive soil and with negative potentials of 1 to 4.3 volts maintained relative to the soil. These tests were reported at the 1934 annual meeting of the Pacific Coast Gas Association. The following conclusions are quoted:

"1—Asphaltic coatings appear to lose their bond rapidly in the vicinity of bare metal spots on a pipe buried in the soil. This applies when no electrical protection is used as well as when the samples were kept at 0.3, 1.0, and 4.3 volts below soil potential.

"2—Coal tar coatings lost their bond, within the limits of this series of tests, when the samples were kept at 4.3 volts and 1.0 volt below soil potential but did not behave in this manner when kept at 0.0 or 0.3 volts below soil potential.

"3—When the coated specimens were subjected to a potential of 4.3 volts and 1.0 volt below the soil potential, both asphalt and coal tar samples lost their bond, blistered or cracked, and were pushed from the metal surface.

"4—With the coal tar samples at 0.3 volts below the soil potential, there seemed to be no greater breakdown of the coating than occurred when no electrical drainage was used. With the asphalt samples, a slightly greater loss of bond occurred when they were held at 0.3 volts below soil potential than when no voltage was applied."

It should be noted that the specimens tested were partly bare, so that current density was relatively high on the exposed surface adjacent to the coating, and loss of bond proceeded progressively from this edge.

A preliminary conclusion from these tests is that if potential differences across coatings under drainage are limited to 0.3 volts, damage will not result. As shown hereafter, it appears possible to

obtain the optimum design for drainage projects, covering a wide range of conditions, without exceeding 1 volt across the coating.

Field tests are now in progress to determine if loss of bond occurs on pipe lines when the coatings are subjected to the voltage which produced this result under laboratory conditions. Until these tests are completed we cannot judge the importance of this action. However, pipe lines have been drained for several years with potentials as high as 2 volts across the coatings, without apparent damage, and several explanations of this inconsistent behavior are possible—current density under field conditions may be insufficient to cause damage, or loss of bond may occur adjacent to breaks in the coating but the total area affected be insignificant, or loss of bond may exist, but without impairing the coating resistance and hence causing no change in the current input. Pending the outcome of field tests we have assumed that potentials of 2 volts or less will not shorten the effective life of bituminous coatings on pipe lines. It should be noted in this connection that the coatings of the laboratory specimens did not include any wrapper, whereas many of the pipe lines now drained have rag or asbestos felt wrappers.

Considering next Question 3—coating breakdown from natural causes—water absorption, cracking due to soil stress, loss of elasticity because of evaporation of volatile constituents, etc.

There is little direct evidence now available from which to reach a conclusion on this point; hence we are limited to deduction based on observation of the general behavior of pipe coatings. First, assuming that drainage voltages are held within values which will not injure the coating, it appears that the beneficial effects of drainage on the life of the coating will be limited to inhibiting corrosion of the underlying steel at cracks or abrasions, thus preventing progressive destruction of the coating from these points, which otherwise would be caused by accumulation of corrosion products. Granting the above conclusion, will this single effect of drainage indefinitely prolong the coating life? In weighing the prospects let us consider the various other causes of coating failure. First—decline of resistance to prohibitively low values.

Table No. 1 covers a survey of resistance of pipe line coatings; conditions with respect to age, type of coating, soil characteristics, water content of soil, differing widely. From a study of these data (Table No. 1) and other tests, it is evident that the resistance of bituminous coatings decreases rapidly during the first few months after burial, following which the curve flattens out and declines quite slowly for an indefinite period. The abrupt reduction during the first few months may amount to 90 per cent or more of the initial value. Coal-tar coatings, in general, show much higher resistances after burial than asphalt, and this difference in behavior of the two materials is undoubtedly attributable to their relative porosity or capacity for water absorption.

G. Corfield has made tests extending over periods of 100 to 600 days, which show that water absorption by asphalt enamels is in general 4-10 times that of coal-tar enamels. The electrical resistance of a coating having appreciable porosity will presumably vary with both the moisture and salt content of the surrounding soil. It appears that decline of coating resistance from water absorption after 2-3 years is unimportant, and that typical minimum values for hot applied coatings are—coal-tar 5000 ohms per sq. ft., asphalt 300 ohms per sq. ft.

Whether the coatings on a given line will not eventually disintegrate because

TABLE NO. 2. ESTIMATED MINIMUM COST FOR CATHODIC PROTECTION OF 38 MILES OF 12¾-INCH PIPE-LINE WITH VARIOUS COATING RESISTANCES

Assumptions: Overall station efficiency = 50 per cent; minimum reduction of "pipe to soil" potential due to draining = 0.2 volts; stations are equidistant.

RESISTANCE OF COATING, ohms per sq. ft.	100	200	300	400	1,000	5,000	50,000
Data for Entire Line							
Total length of pipeline protected—37.8 miles							
Total number of drainage stations	35	20	16	15	10	4	2
Spacing of drainage stations—miles	1.08	1.89	2.36	2.52	3.78	9.46	18.9
Yearly total cost—Dollars	12,240	6,980	4,940	4,005	1,959	539	187
Yearly total cost per mile—Dollars	324	185	131	106	52	14	5
Total investment—Dollars	25,400	14,460	10,800	8,130	3,515	1,046	216
Total investment per mile—Dollars	672	382	285	215	93	28	6
Per Station							
Current drained—Amperes	45.1	44.7	35.7	28.50	16.9	9.42	1.48
"Pipe to soil" potential at drain points—Volts	0.6	0.49	0.48	0.45	0.43	0.51	0.30
Number of 6-in. x 15-ft. vertical iron ground electrodes, spaced 20 feet apart	15	15	15	10	5	5	1
Total resistance of ground connection—Ohms	0.25	0.25	0.25	0.33	0.52	0.52	1.5
"Ground electrode to soil" potential—Volts	11.4	11.4	9.1	9.40	8.81	4.90	2.22
Potential across rectifier terminals—Volts	12.0	11.9	9.6	9.85	9.24	5.41	2.52
Rating of rectifier, D.C.—Watts	541	532	342	281	157	50.9	3.7
Power required, A.C.—Watts	1,082	1,064	684	562	314	102	7.4
Energy used per month—Kw.H.	780	777	499	411	229	74	5.4
Energy cost per month—Dollars	13.00	13.00	10.20	9.25	6.20	3.10	1.25*
Average rate—Cents per Kw.H.	1.68	1.68	2.05	2.25	2.71	4.19	.....
Energy cost per year—Dollars	156.00	156.00	122.00	110.70	74.50	27.20	15.00
Cost of rectifier—Dollars	335.00	333.00	285.00	265.00	200.00	110.00	40.00
Cost of ground electrodes—Dollars	390.00	390.00	390.00	277.00	151.50	151.50	68.00
Total investment per station—Dollars	725.00	723.00	675.00	542.00	351.50	261.50	108.00
Yearly total fixed costs—Dollars	117.50	117.00	109.30	87.80	56.80	42.30	17.50
Yearly rectifier maintenance expense—Dollars	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Yearly ground electrode maintenance expense—Dollars	16.00	16.00	16.00	8.50	4.62	5.32	1.06
Yearly rectifier operating expense—Dollars	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Yearly total cost per station—Dollars	349.50	349.00	308.00	267.00	195.92	134.82	93.56
Yearly total energy cost per mile—Dollars	144.50	82.50	51.70	43.80	19.70	2.40	.79

*Minimum charge.

of soil stress and/or evaporation of volatiles depends, of course, on the coating and the soil; however, certain bituminous coatings seem to retain their "life" or elasticity after long periods, and it has been established that a wrapper of inorganic material affords considerable protection against destructive mechanical action by heavy soils. Furthermore, under some conditions the flow of current toward a cathodic pipe line gradually builds up a layer of salts surrounding the pipe, which may provide both mechanical and chemical protection.

To sum up, it is yet to be demonstrated that electrical drainage will defer reconditioning for an indefinitely long period and thus, correspondingly, prolong the useful coating life, but experience to date has been quite favorable, and it is my opinion that provided—

1. The coating is reasonably impervious to water, and
2. Soil stress is absent or coating adequately resists such action, and
3. The coating does not disintegrate due to inherent defects,

then drainage can be continued indefinitely without reconditioning, and corrosion will be eliminated.

When investigating the economic feasibility of any drainage project it is necessary to make assumptions regarding the increase in coating longevity which can be effected. Thus if no extension of coating life be assumed, cost of drainage must be equated only against the cost of repairing leaks due to pitting during the normal life of the coating, plus the value of gas lost through undetected leakage. Such savings alone are usually insufficient to justify the expenditure for drainage; however, where cost of repairing leaks is abnormal, as in submarine crossings, involving dredging and diving work, the insurance against pitting may make electrical drainage well worth while. Incidentally, such crossings frequently become discharge areas for long line currents if the pipe is exposed by abrasion or other coating failure.

Considering next the factors which influence the cost of electrical drainage, and its application to new and old pipe lines.

Electric railway currents will not ordinarily be available for the drainage of transmission lines and hence this method is not included herein.

The important items which govern annual per-mile cost of cathodic protection are:

1. Unit resistance of coating.
2. Cost of ground electrodes, which varies with soil resistivity and moisture content.
3. Unit cost of electric energy.

As shown in Table No. 1, the resistance of pipe coatings varies over a tremendous range — from 10,000,000 ohms to 16 ohms per sq. ft., dependent on age and material. However, if we consider only hot bituminous applications, and exclude the initial figures before water absorption has occurred, and which are therefore of little practical importance, the variation is narrowed down to a range of say 50,000-300 ohms per sq. ft.

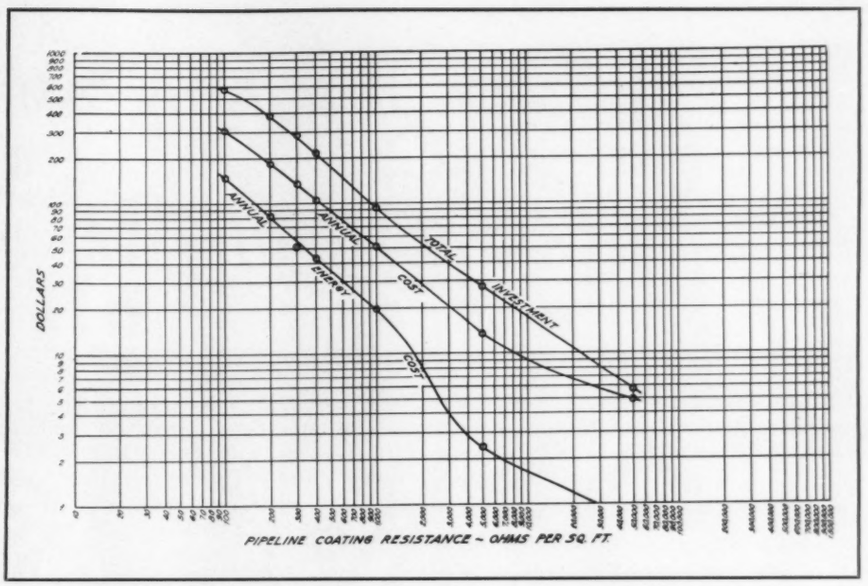


FIG. 2. Investment and annual operating expenses per mile for cathodic protection of 12-¾-inch pipe line. Total length 38 miles.

The drainage current necessary to maintain the minimum protective voltage across the coating is an inverse exponential function of the coating resistance, other factors being constant. Fig. 1 shows total current input per mile of 12-inch pipe line in relation to coating resistance. Current input also varies directly with the potential difference across the coating at the extremities of the drained section; hence it is important to hold this to the least value which will prevent corrosion. Kuhn recommends 0.3 volts; laboratory tests by Corfield indicate that 0.1 volt is sufficient. We have tentatively adopted a minimum of 0.2 volts, which figure is used herein in estimating energy requirements and costs.

Table No. 2 and Fig. 2 show the variation of annual drainage costs per mile of 12-inch main, with coating resistance. These are derived in part from the current-resistance relation of Fig. 1, which accounts for the steepness of the cost curves.

While Table No. 2 and Fig. 2 have been developed from actual experience under conditions prevailing in Southern California, the relation derived should be generally applicable. Each point plotted represents overall annual costs for the most economical project designed to maintain the required potential across a coating of the given unit resistance. In order to simplify the graph the number of variables has been minimized.

Pipe line—12¾-inch O.D., 34 pounds per foot.

Ground Electrodes

Multiple units consisting of 15 feet of 6-⅝-inch pipe (scrap material) buried vertically, spacing 20 feet.

Resistance per electrode—1.5 ohms (anodic conditions).

Metal loss—5 pounds per ampere per year.*

Coating Resistance

Varying from 100—50,000 ohms per sq. ft.

Minimum negative potential maintained to ground at extremities of drained section=0.2 volts; maximum at drain points=1 volt.

Fixed Charges

Interest 7 per cent.

Depreciation 7.6 per cent (10 year life of equipment except electrodes)*

Energy Cost

As per general power schedule (blocked load factor rate) effective throughout Southern California. This schedule is similar in form to those applicable in many other sections of the country, although somewhat lower than most. The rate varies from 4.2c to 1.7c per KWH for the monthly usage included in this study. If a straight rate per KWH, regardless of consumption, were used, the results would be misleading, as such power schedules are very rare.

Energy Source

220 volts A.C., converted by copper oxide rectifiers with overall efficiency of 50 per cent.

*Depreciation of electrodes at this rate, or cost of metal loss, whichever is the greater, is used. This annual loss of anode metal is based on experience and is 25 per cent of the theoretical value.

The local factors entering into the drainage cost computations are soil resistivity, which affects electrode investment; and electric rates. Assuming that the figures used for these items are typical, we may proceed to test the economic

(Continued on Page 40)

The Chicago Space Heating ..Some of Its Engineering

By H. B. JOHNS

IN any campaign for the sale of space heating equipment which is as intensive as the Chicago campaign has been, it is practically impossible to anticipate all of the problems which will arise as the campaign progresses.

Old Organization Expanded: In the first place, the old organization of some 30 sales engineers was expanded almost overnight to a group of some 150 salesmen, 35 supervising engineers, and six sales directors for The Peoples Gas Light and Coke Co., while a comparable expansion took place in the other two companies taking part in the campaign (The Public Service Co. of Northern Illinois and the Western United Gas and Electric Co). Almost all of the new salesmen were experienced in various lines of door-to-door selling, but very few had even seen a piece of gas-fired heating equipment before. The men were given three days of classroom schooling before taking up their active sales duties.

Simplified Selling: In order to make the selling as simple as possible, conversion burners for all hot water, steam, and warm air installations up to a certain capacity were given a standard price of $149.50 and payments of $3.00 per month. This "standard package" included any burner with a capacity not greater than 240,000 B.t.u. input per hour; it also included a plain room thermostat and the necessary limit controls. Since a large number of sales were expected to be in this class, a contract form was prepared with the terms and amounts already printed in the proper places. This contract permitted a trial period of one year during which no interest was charged and the customer could have the burner removed at any time during the year, if he so desired.

Similarly, a simplified form of estimating heat losses was devised with a standard set of factors to be used for a number of different types of building construction. The supervising engineers checked the heat losses after sales were made and made recommendations as to the exact size and type of burner to be used.

Dealer Cooperation: In order to enable contractor-dealers to sell gas heat on the same terms as the utilities, contract forms with "standard package" terms already printed on them were prepared for them. These contracts are assignable to the respective utility company. Upon acceptance of a contract, the utility pays the contractor 90 per cent of the face value of the contract, less the price of burner and control equipment supplied by the utility. The remaining 10 per cent of the value of the contract is paid to the dealer after four monthly payments have been paid by the customer.

Similar arrangements are made with other assignable contract forms (except that the spaces for the amount of the contract and the monthly payments are left blank), to be used for other than "package" sales.

Refinements Necessary: As the campaign progressed, a number of refinements were found necessary.

First of all, the duties of the supervising engineers were too great. It was too much to have one man supervise five salesmen and then check the heat loss surveys and other details on every sale made. For this reason, each supervising engineer was given an assistant who took care of the checking, while the supervising engineer spent more of his time as a crew manager for his salesmen. The assistant engineers were paid straight salaries, while the others (both salesmen and supervisors) were on salary and commission.

In addition, a group of six special engineers was organized with headquarters at the main office to assist in solving the various installation and other engineering problems which developed in the field, and to check all "Larger than Package" burner specifications.

Boiler-Burner Specification Handbook: One of the very important contributions from this group has been the development of a manual or handbook showing exactly what conversion burners (by name and model) are most suitable for each of the many makes and sizes of coal and oil-fired boilers found in Chicago. This work, which was thought to be impossible of achievement by some, has proven to be of inestimable value in that it insures the specification of the proper burner for a given boiler, regardless of inaccurate heat loss computations, improperly or unusually sized coal boilers, etc. The present volume is in two parts; one for cast iron boilers and the other for steel boilers. A third part, on cast iron and steel warm air furnaces, is being prepared.

In addition to showing the make and model of each coal boiler, enough measurements (grate or overall) and other data (number of sections) are shown to insure positive identification of each boiler, even though the name plate is incorrect or missing. Similarly, in addition to giving the make and model number of each burner suitable for a given boiler (in the order of preference), the proper hourly gas input also is specified.

Baffling of Boilers and Furnaces: Another important study was that showing the necessity for baffling coal boilers and furnaces when converted to gas.

The importance of keeping the excess air in the combustion products at a minimum has long been recognized in the burning of all fuels. This was accomplished from the very beginning of the Chicago campaign by reducing the size of the boiler or furnace flue breeching in accordance with the amount of gas to be burned per hour, and also in accordance with the design of the boiler or furnace, length of flue pipe, etc. Other adjustments included the primary and secondary inlets, sealing of cracks and other openings in the boiler, or furnace, etc. These adjustments in themselves, however, do not insure the best possible operating efficiency; for even though the excess air has been kept down to a minimum, it still is possible for the hot combustion gases to by-pass important heating surfaces, thus causing unduly high flue temperatures and excessive stack losses.

In a great many instances, the best operating efficiencies can be obtained only by the proper baffling of the flue gas passages. The important feature is

Campaign Aspects

Manager House Heating Division
The Peoples Gas Light and Coke Company

that the combustion products must come into intimate contact with the heat-absorbing surfaces. This is done first of all by installing a burner which adequately fills the firepot or combustion chamber in such a manner that the combustion products come into intimate contact with the side walls (primary heat-absorbing surfaces) of the chamber. Refractory baffles or radiants usually help this action.

Methods of Baffling: The passages through the secondary heating surfaces then should be baffled with sheet iron or fire brick so that the combustion products are forced into the most intimate contact with the heating surfaces.

Round boilers, for example, with a large round opening in the crown sheet can be baffled by supporting two half circles of sheet iron far enough above the opening to permit the combustion products to escape properly. The diameter of these half circles of sheet iron must be great enough that, as the combustion products are forced around the sheet iron, they come into intimate contact with a greater portion of the heating surfaces. In other words, short circuiting of the flue gas travel is avoided.

In rectangular boilers, on the other hand, the problem is not so much to avoid short circuiting as it is to avoid having the inner "core" of flue gases pass out of the boiler without coming into intimate contact with the walls of the secondary heating surfaces. In boilers where the upper flue passes are more than 3 inches wide, these center "cores" are readily broken up by inserting brick supported by channel iron or sheet iron bent into the form of an inverted "U".

Tubular steel boilers usually can be baffled by inserting spiral strips or other devices in the tubes to give turbulance to the flue gases.

Circular radiators in cast iron furnaces can be baffled by inserting about a dozen 1-inch split firebrick in such a manner that they lean in an upright position against opposite sides of the radiator.

TABLE NO. 1. AVERAGE RESULTS OBTAINED FROM BAFFLING BOILERS AND FURNACES EQUIPPED WITH GAS FIRED CONVERSION BURNERS

	90 Round Boilers	31 Sectional Boilers	3 Steel Boilers	22 Cast Iron Furnaces	Total of 146 Jobs
Heat Loss B.t.u. per Hr.	84,452	114,826	141,899	67,280	89,494
Calcd. Max. Gas Rate—Cu. Ft. per Hr.	212	287	354	155	222
Per Cent—Flue Loss					
Before Baffling	21.0	22.8	20.8	22.5	21.6
After Baffling	18.7	18.8	17.9	18.9	18.7
Reduction	2.3	4.0	2.9	3.6	2.9
Before Baffling — Heating Cost — Rate per Year	$205	$271	$337	$156	$215
Gas Rate—Cu. Ft per Hr. (800 B.t.u.)					
Before Baffling	208	265	336	146	214
After Baffling	210	268	336	154	217
Flue Temperature °F.					
Before Baffling	461	472	446	503	469
After Baffling	394	407	363	389	395
Reduction	67	65	83	114	74
After Baffling — Heating Cost — Rate per Year	$181	$232	$284	$135	$187
Per Cent Reduction in Operating Cost	11.7	14.4	15.7	13.5	13.0
Hot Water Heating Systems	52	18	....	....	70
Steam Systems	38	13	3	....	54
Warm Air Systems	....	....	....	22	22

In all of these applications, care must be taken that the baffle does not cover a portion of the heating surface and in that way hinder rather than help the transfer of heat.

Results Obtained from Baffling: Saving in operating costs running sometimes more than 35 per cent and averaging more than 10 per cent have been obtained by baffling boilers and furnaces.

In endeavoring to determine the exact benefits obtained from baffling, one naturally turns to the flue gas analysis as a guide to whatever change in efficiency may have taken place. Strange to say, however, this is not an infallible guide, as is to be noted from Table No. 1.

The average flue loss in this table is shown as being reduced only 2.9 per cent (21.6 per cent to 18.7 per cent), but the reduction in seasonal operating cost was exactly 13 per cent. In fact, instances have occurred where the flue loss was increased slightly (by changes in gas rate, air adjustment, etc.) and yet the seasonal operating cost showed a substantial reduction after the changes (including baffling) were made.

One explanation of this rather strange inconsistency is that heating systems seem to have a certain "critical heat input" which must be exceeded in order to obtain the best operating results. When this critical hourly input rate is exceeded, less fuel is required for the season and better operation of the entire heating system seems to be obtained. This is true particularly of steam systems although hot water and warm air systems also seem to have a "critical input".

The "Two-Flat Package": As mentioned previously, a number of burners (with the necessary controls) were offered in this campaign as a "standard package". In this way, the salesmen did not know the exact make and model of burner to be delivered to his customer, but he did know that the terms he was offering were suitable for this type of installation. In other words, he sold the comforts of gas heat and not an appliance. This standard package plan worked quite well but it soon developed that there were so many details involved in the larger than "package" burners that some relief was needed. This was particularly true of burners for two-apartment buildings. In order to simplify this procedure, therefore, a "Two-Flat Package" was made to include any burners with a capacity of not more than 600,000 B.t.u. input per hour with a Chronotherm thermostat and whatever limit controls were necessary. This package was to be used for any two-flat building with a heat loss of less than 300,000 B.t.u. per hour, and the price was $238.50, with monthly payments of $4.45 each. Variations in the controls used were permitted, with the proper adjustment of price.

This plan was found to be very helpful and an additional plan now is being tried which permits burner capacities up to about 325,000 B.t.u. input with a price of $204.50 in combination with 3 inches of fill insulation for $140.00 (a total price of $344.50). In addition to the usual benefits of insulation, this latter plan has the important advantage of correcting the inadequacy of the sec-

(Continued on Page 61)

Job Training *in a* Distribution Department

EMPLOYEE training is a broad subject, and one much in the forefront of attention in the industry. There is no utility so small but what it attempts to render some sort of instruction for its workers, particularly those charged with public contacts. The following article is the first installment in a discussion by Mr. Holtz of methods adopted by his company for specific job training in the distribution department. The author, who is chairman of the educational committee for Southern California Gas Co., employees of which number approximately 2,000, has investigated educational methods within the gas industry widely, and the procedure which he discusses should be of general interest.—*Editor.*

Lee Holtz

DURING the past several years nearly all utilities have come to recognize the importance of job training. Most of the companies which had training courses in progress a few years ago have now expanded and intensified their training, and many which previously had no training courses are now starting this work. The two principal stimulants to the development of job training seem to be, first, the necessity for giving a higher grade of services to customers; and second, the rapid trend toward automatic control and other features of improved design in modern gas appliances, necessitating specialized training for workers making appliance adjustments.

Several large utilities have installed very extensive classroom facilities for instruction to employees. These include numerous appliances connected to an arrangement of piping and contrivances behind a panel whereby various faults in gas supply can be arranged to duplicate the actual troubles encountered in the field. Space requirements and the necessary investment in equipment make it impossible for the average utility to utilize this type of training set-up. In this article is presented a method used by the Southern California Gas Company which duplicates the results obtainable by more elaborate installations through use of a relatively simple and economical device. This equipment has proved very satisfactory, and should be of interest to any utility contemplating or operating a job training course for distribution employees.

The educational work within the company is supervised by a committee of three general superintendents. A course on general information relative to the gas industry is being given to all company employees by means of lectures occurring about once every six weeks. The subjects covered so far are "History of The Gas Industry", "History of the Southern California Gas Co.", "Public Relations", and "Geology and Oil Well Drilling". The committee contemplates giving special courses, which will embrace training in specialized work such as telephone contacts, and which will include employees from a number of departments.

The job training courses are conducted entirely within a department, and give instruction to the employee in the work peculiar to his job. It is this type of training, pertaining to the distribution department, that is discussed below.

The distribution department has a curriculum committee which prepares all of the courses. Instructors are men selected from the ranks to teach the same work as that in which they are engaged. The subjects already given to the employees, mostly servicemen, are, "Servicing Gas Ranges" (including clock controlled ranges), "Servicing Refrigerators", and "High Bill Investigations". Other subjects will be given in the near future, including "Emergency Work Training", "Turn-on and Turn-off Training", "Servicing Water Heaters", and "Servicing Space Heating Equipment". Central heating, unit and floor-type furnace equipment will also be treated in later instruction.

This job training instruction is given to small groups, in order to give each man a better opportunity to observe the demonstration, ask questions, and enter into discussions. Classes usually consist of 8 to 10 men, and meet once a week for two hours.

By conducting a class everyday, six groups can be taking a course at one time from a single instructor who teaches a two-hour class each day.

Experience in conducting the classes indicates that the best time of day for this work is early in the morning. Classes begin at 7:45, allowing the men to go to work about 9:45. The regular starting hour for service men is set at 8:30, as a measure of good customer policy, since it brings the workers on the home premises at a time more convenient to the customer than an earlier hour.

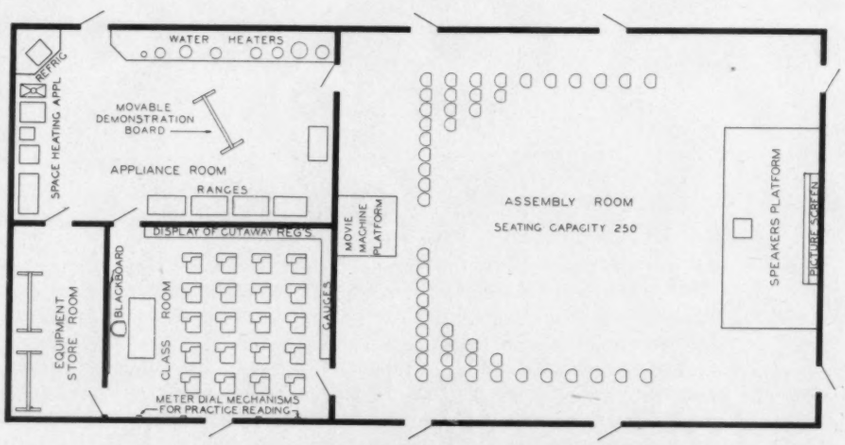
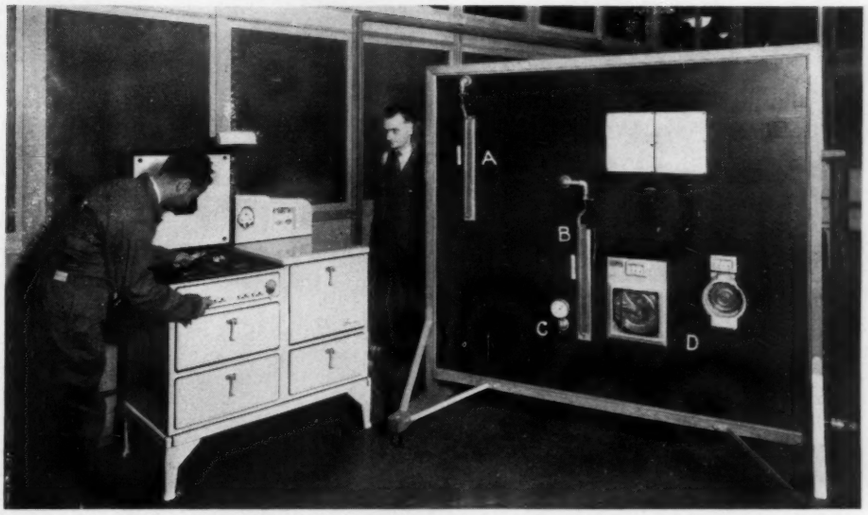


Diagram of job training classrooms, distribution department, Southern California Gas Company

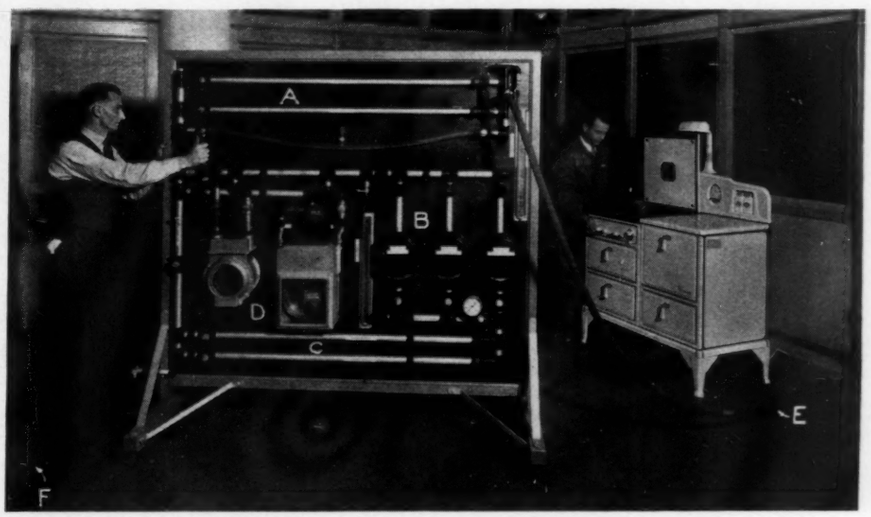
By LEE HOLTZ

General Superintendent, Manufacture and Distribution, Southern California Gas Company



FRONT VIEW OF DEMONSTRATION BOARD IN OPERATION

A. Water column gauge showing pressure at appliance.
B. Water column gauge showing pressure between regulator and meter.
C. High pressure gauge showing pressure between service line and regulator.
D. One tin meter and one iron cased meter, each fitted with glass sides to show operation of working parts.



REAR VIEW OF DEMONSTRATION BOARD IN OPERATION

A. Three house lines; one plugged, one containing fluid, and one clear.
B. Three regulators set for pressures; one set too high, one set too low, and one set correctly.
C. Two service lines; one plugged and one clear.
D. One tin meter and one iron cased meter, each fitted with glass sides to show operation of working parts.
E. Hose line from demonstration board to the appliance.
F. Hose line from high pressure gas supply to the demonstration board.

Thus the early morning training classes take a minimum time from the day's work. Also, the men are found to be in better condition to learn at this time of day.

The accompanying diagram gives the arrangement of the classrooms. These consist of an assembly room seating about 250 people, a classroom seating about 20, an appliance room, and an equipment storeroom. In most of the job training work, only the classroom and appliance room are used. The instructor gives most of his lectures and demonstrations of lighter parts of equipment in the classroom where the men may sit comfortably and take notes. The class may move into the appliance room for demonstration and practice work without loss of time or inconvenience.

The outstanding feature of this job training appliance room is the moveable demonstration board. It is used primarily for the instruction of new service men. The board is mounted on wheels so that it can be moved to any appliance on the floor, or be taken by truck to an office in an outlying district where classes may be held. The appliance is connected to the front of the board, which has gauges and gas meter dials mounted thereon. The back of the board is fitted with parts of services, regulators, meters, and parts of houselines in such a manner that the gas may flow through one or several of these contrivances. The adjustments on the back of the board will give the same operating characteristics as are encountered in the field when there is a plugged service, or the regulator gives too high or too low a pressure, or the houseline is plugged or has fluid in it. The man adjusting the appliance in the front of the board has his U-gauges and meter dials, and the noted operation of the appliance, to aid in determining where the trouble lies. In this manner the employees are taught the effect of these various conditions upon the operation of appliances, and how to determine the nature of the trouble from the pressures obtained and the observations made.

In the appliance room there are various water heaters, ranges, space heating equipment and refrigerators. The demonstration board may be moved to any of these appliances and connected by means of quick-clamping hose connections. Any appliance may be brought into this room and connected for testing or demonstration work. Due to the readily moveable demonstration board, a large room or a large number of connected appliances is not necessary.

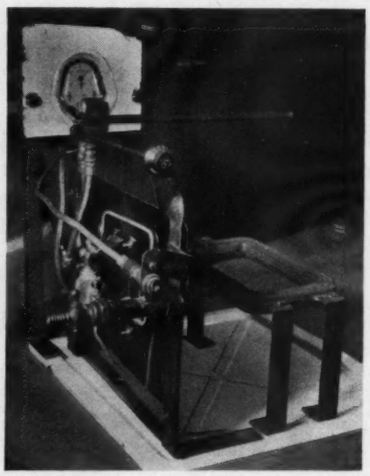
Other special equipment developed for use in these job-training classes includes displays of water heater burners, and also of meter parts, mounted on portable frames or partitions so that they may be moved around a classroom or put on a truck to be transported to a division office. The water heater burner display is mounted on a pipe frame with wheels. A quick-clamp hose connection allows all burners to be lighted to demonstrate adjustments and operation of automatic devices. The meter parts are mounted on a moveable partition, and this also includes cutaway models of assembled

AT LEFT:

Classroom used in Southern California Gas Company distribution department job training.

BELOW:

Working parts of a clock controlled range assembled in a portable unit for demonstration.



meters which demonstrate the operation of the meters.

Several other demonstration units have been constructed, consisting of the oven burners and other working parts of a clock controlled range, connected together compactly so that they may be connected to a gas cock and operated.

Since the Southern California Gas Co. serves in such an extended territory, some districts being 200 miles from Los Angeles, the instructor has been sent out to conduct classes in the division offices. However, within 30 miles of Los Angeles the men are brought into the classrooms in the Distribution Building where the facilities are much better for instruction, and after the educational training has become more of a routine activity it is planned to bring classes from all districts into the central classrooms. When employees are brought in from the outlying districts it is planned to give them a complete course before they return to their jobs. There will always be some occasions when instruction at outlying offices is advantageous, as for example, when sales campaigns on new appliances are planned, or when other conditions necessitate getting specific training to all distribution employees speedily.

The training in the division offices is conducted in rooms which are equipped with gas connections and which provide ample space for instruction. The instructor goes into the division and conducts classes every day until the workers have completed the course in question. The equipment for that particular course is set up and remains until the course is finished. Classes are generally held more often than once a week in these division courses, because there may be too few taking the course to provide six groups. The instructor generally takes from the central training quarters a number of working parts, cutaway models, and other demonstration equipment for use in the division classes.

One of the outstanding advantages of centralized classroom instruction is that it affords complete control of the teaching procedure. Without classrooms, instruction would necessarily be carried on by sending new service men into customers' homes with experienced men. Not only is it sometimes found questionable policy to make a laboratory of the customer's home, but also conditions are never right for proper instruction on consumer's premises. The instruction is never complete nor as uniform as can be obtained in a classroom, and the length of time required to train a man in the customer's home results in greater cost to the company. However, after the men have had the classroom training, the instructor spends a few hours with each man in the field, making several calls with him, to check his work and offer suggestions.

Having in mind the foregoing comments upon classroom methods and demonstration facilities it may be of interest next to consider the organization and scope of instruction on specific subjects. The first course instituted by the company was that on gas ranges, and a description of this course will conclude the present installment.

The gas range course was given in a series of four meetings, two hours each, over a period of four weeks. The last meeting included an examination, papers being graded and returned to the employees after the gas range classes had terminated. The outline of the gas range course will be found below, and following it are reproduced the questions which comprised the gas range course examination.

GAS RANGE COURSE
LESSON I

1. First discuss the procedure to be followed in servicing gas ranges. This procedure is as follows:

PROCEDURE IN ADJUSTING RANGES

a. Obtaining admittance into the house.

b. Canvas to be placed on the floor and tools placed on it.

c. Inspect all cocks on the range to see that they are closed and then open the oven door to see that there is no food in the oven.

d. Take the gas pressure at the range.

e. Light the oven.

f. Adjust the top burners and pilot.

g. Check the minimum flame and oven pilot.

h. Adjust oven temperature control. This adjustment should not be made unless the customer says that she has had trouble with her oven or if for any other reason the accuracy of the oven control is doubted.

i. Inspect all burner cocks to see if they work freely and also inspect for leakage.

j. Tighten all panels, door handles, catches, etc.

k. The service man must also be prepared to give information when it is requested by the customer or at times when it can be tactfully volunteered.

2. In obtaining admittance to the home the service man should go to the rear door and in knocking or ringing the door bell should allow sufficient time for the customer to come to the door before repeating the knock. He should address the customer, if female, as "Madam, I am from the Gas Company and am here to service your gas

(Continued on Page 65)

Operation of Compressor Plant Engines

TRANSMISSION

● FROM REPORT of Pacific Coast Gas Association Committee on Compressor Plants, A. H. Newby, Southern California Gas Co., Chairman; presented to Annual Convention, Del Monte, Calif., October 9-12, 1934.

Valve Timing of Cooper 760 H. P. Twin Tandem Horizontal Engines*

THOSE who have had to time valves on Cooper twin tandem horizontal engines may be interested in the following description of a device which greatly cuts down the time and labor usually required for this operation.

A. H. Newby

A 36-inch cast iron wheel, originally supplied with a 16-inch gate valve, was graduated and stamped every 5 degrees of its outer circumference, there being about an inch between each 5-degree graduation. A hole was drilled through every other of the six spokes, near the center ring, and the wheel was bolted with three bolts to a disk of steel, ¾-inch thick, on the outer circumference of which was arc-welded a Ford Flywheel ring gear.

The engine was placed on 60° with the flywheel mark and pointer. This brings the R. H. crank near the top quarter, in which position the drag link connecting the crank pin with the gear box cross shaft can be readily dismantled. Before dismantling the drag link, a wooden wedge was driven in between the lay shaft coupling and the main frame, to insure the lay shaft remaining in its position with reference to the crankshaft.

The 36-inch wheel, disk and ring gear was then bolted to the flange of the cross shaft, using the same bolts which bolt on the oil ring. A bracket carrying an adjustable pointer was bolted to the frame, using the tapped holes which secure the hood. This pointer was adjusted to coincide with the 60° mark on the 36-inch wheel, thus placing the 36-inch wheel in the same relative position to the cam shaft as the main flywheel.

A Bendix starter pinion was arc-welded to a shaft passing through a sleeve. This sleeve was welded to a bracket which was bolted to the frame with the bolts securing the gear box, in such position that the pinion meshed with the rear gear. A 24-inch wheel with a crank handle from an old meat grinder was keyed to the outboard end of the pinion shaft.

After the assembly was in place the wooden wedge was removed, thus permitting the lay shaft to be rotated by turning the crank hand wheel.

The customary dial gauge, mounted on an adjustable support, was set to indicate the extreme of movement of valve to be timed, and instead of jacking the whole engine around, the lay shaft alone was revolved by means of hand crank and gears.

The valve mechanism was so adjusted that the valve opened and closed at points indicated by the pointer of the 36-inch wheel to correspond to the number of degrees specified by the manufacturer's timing chart.

The dial gauge was then mounted on each of the other valves of R. H. engine and this process repeated. All valves and ignition on the R. H. side were then made to open and close at specified points as indicated by the pointer of the 36-inch wheel marks. The 36-inch wheel was then turned to the 60° mark, and the lay shaft again secured against rotation by the wooden wedge. The timing device was then removed, and the drag link assembled, connecting the lay shaft to the crank pin, after which the engine was jacked around two revolutions during which all events of timing were given a final check in relation to marks on the main wheel and pointer.

A check on the first event showed whether any adjustment for early or late timing was necessary, and if so, adjustments were made on the connection of the drag link to cross shaft flanges. The assembly was then set up on the L. H. side and a similar process repeated.

It was found that the described device saved a lot of time and hard work, as with it the lay shaft could be readily revolved as many times as necessary to get everything very accurately adjusted, and it was necessary to jack the whole engine around four revolutions only. The device is so made that it can be readily changed from R. H. to L. H. sides and from one engine to another.

*Submitted by Leal Davis, Pacific Gas and Electric Co.

Calibrating Mixing Valves on 18x 20-Inch Cooper-Bessemer Gas Engines

Fig. 1 illustrates the mixing valve and adjusting wheel on the Type 75 and the Type 80 Cooper-Bessemer gas engines and a method of calibrating this adjusting wheel.

The horizontal lines were scribed around the adjusting wheel by the manufacturer. A reference point is stamped on the bonnet, as shown by the arrow, and 10 vertical lines scribed around the wheel, numbered 0 to 9, and equally spaced around the circumference. The horizontal lines are numbered 10, 20, 30, etc., from top to bottom, but these numbers are not stamped on the wheel.

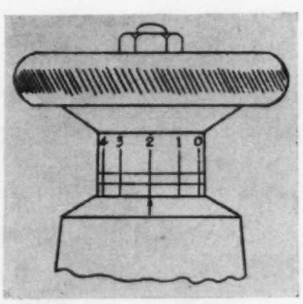


FIG. 1.

The adjusting wheel is threaded with eight threads per inch and the horizontal lines are spaced 1/8 inch apart, so that one complete revolution of the wheel moves the mixing valve 1/8 inch and either exposes or conceals one horizontal line. Moving the wheel 1/10 revolution or one division on the vertical scale raises or lowers the mixing valve 1/80 inch giving a fine adjustment on the mixing valve.

The setting shown in Fig. 1 is 32 as three horizontal lines are exposed and No. 2 vertical line is on the pointer. Turning the wheel one revolution to the right would expose another horizontal line and the setting would be 42.

A chart is maintained showing the setting on each mixing valve; then, in case the setting has been changed for any reason, the mixing valve can be reset by referring to the chart. When a change is made in the adjustment on account of changed conditions this new setting is recorded on the chart.

Piston Rings on Large Single-Acting Gas Engines

On large single-acting gas engines with air cooled pistons, the ordinary step-cut or diagonal cut snap piston ring is satisfactory for all ring grooves when

the cylinder is in good condition. With worn cylinders, the so-called seal rings will materially decrease leakage by the piston and will increase engine performance.

Referring to the ring positions as 1, 2, 3, 4, etc., with No. 1 as the fire ring, and numbered towards the skirt of the piston, it is advisable, when using power seal rings, to install the ordinary snap rings in grooves Nos. 1 and 2, and the power seal rings in the remaining grooves, as two power seal rings will prevent leakage by the piston.

The ring grooves in the piston must be true and free from wear so that the rings will have a tight seal against the side of the grooves. The following side clearances are recommended between the ring and the groove:

No. 1 ring	.008 to .010-inch
No. 2 ring	.006 to .008-inch
Nos. 3 & 4 rings	.004
End clearance	.002 to .004-inch per inch diameter of piston

On vertical engines when the pistons and cylinders are lubricated by the splash system, it is advisable to use an oil ring in the lower groove with the ring groove bled for the control of oil consumption.

On horizontal engines, oil is fed to the cylinders by means of a mechanical force feed lubricator. The correct amount of oil to use is the minimum amount that will cover the cylinder walls with a thin oil film without voids or dry spots. For example: for 18-inch bore by 20-inch stroke cylinders, use .4 to .5 gallon of lubricating oil for 24 hours per power cylinder.

Formulas for Designing Parallel Pipe Lines

• **T. W. JOHNSON and W. B. BERWALD, U. S. Bureau of Mines Petroleum Experiment Station, Bartlesville, Okla.; in U. S. Bureau of Mines Report of Investigations 3241; topic "Formulas for Designing Natural Gas Pipe Line Systems Consisting of Parallel Lines"—(Abstract):**

THIS report deals with the design of pipe line systems consisting of lines laid parallel to each other. The lines are referred to as the original line and the parallel lines. The paralleling line may or may not extend the entire length of the original line; however, the parallel line is connected at its two ends to the original line.

It is believed that to a large extent future expansion in the natural gas industry will consist of paralleling the present lines. The several formulas given in this report have been developed to aid in the design of such systems. Curves and tables were prepared from these formulas to simplify the calculations materially and to facilitate determination of the sizes of pipe to be used in paralleling various diameter lines to give the most economical design.

The following formulas for solving problems relating to parallel lines are based on Weymouth's formula for the flow of gas through pipe lines. This formula is:

$$Q = 18.062 \frac{T_o}{P_o}\left[\frac{(P_1^2 - P_2^2)\,d^{16/3}}{GTL}\right]^{1/2}$$

where,

- Q = volume, cubic feet per hour at temperature and pressure bases of T_0 and P_0,
- T_0 = temperature base, degrees Fahrenheit, absolute,
- T = temperature of flowing gas, degrees Fahrenheit, absolute,
- P_0 = pressure base, pounds per square inch, absolute,
- P_1 = inlet pressure, pounds per square inch, absolute,
- P_2 = outlet pressure, pounds per square inch, absolute,
- d = internal diameter of pipe inches,
- G = specific gravity of gas (air = 1.00), and
- L = length of pipe, miles.

The following formulas are applicable under the conditions that after a section of the original line (or all of it) has been paralleled, the temperature and specific gravity of the gas and the pressures at the inlet and outlet ends of the original line are the same as they were before paralleling.

Throughout the report the following quotation is used:

- X = portion of length of original line paralleled, expressed decimally,
- d = internal diameter of original line, inches,
- d_1 = internal diameter of parallel line, inches,
- Q = volume of gas flowing through the system before paralleling, cubic feet per hour at base conditions of pressure and temperature, and
- Q_1 = volume of gas flowing through the system after paralleling, cubic feet per hour at base conditions of pressure and temperature.

The following formula is used to determine the portion of the entire length of line of a given diameter that must be paralleled with the same or a different diameter of pipe to increase the volume the desired amount.

$$X = \frac{\left[\left(\frac{Q}{Q_1}\right)^2 - 1\right]}{\left(\left\{\frac{1}{\left[1+\left(\frac{d_1}{d}\right)^{8/3}\right]^2}\right\} - 1\right)} \qquad \text{-----(1)}$$

Equation (1) may be rearranged to give an equation for the volume flowing through a system for any percentage of length of line paralleled with any diameter pipe.

$$Q_1 = \frac{Q}{\left[X\left(\left\{\frac{1}{\left[1+\left(\frac{d_1}{d}\right)^{8/3}\right]^2}\right\} - 1\right) + 1\right]^{1/2}} \qquad \text{--(2)}$$

Equation (1) may be rearranged also to give an expression for the diameter of the paralleling line that will be required to increase the flow of gas a given amount for a given portion of line paralleled.

$$\frac{d_1}{d} = \left(\left\{\frac{X}{\left[\left(\frac{Q}{Q_1}\right)^2 - 1 + X\right]}\right\}^{1/2} - 1\right)^{3/8} \qquad \text{-------(3)}$$

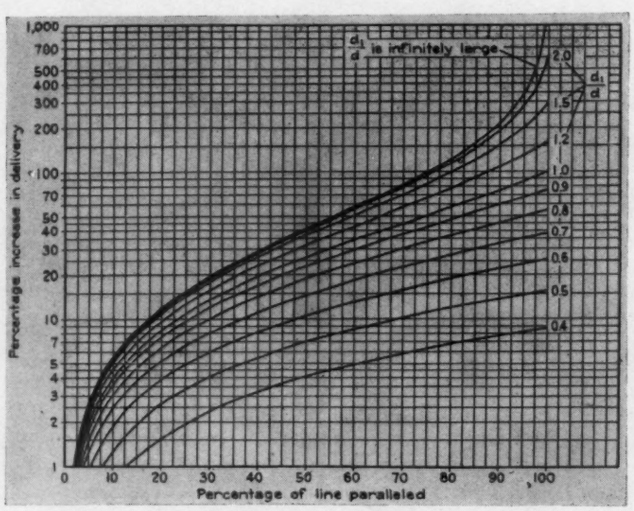


FIG. 1.

Relationship between percentage increase in the delivery and percentage of the original line paralleled for different values of $\frac{d_1}{d}$.

Note: d_1 = internal diameter of parallel line. d = internal diameter of original line.

When the value of X is 1, or, in other words, when the entire length of the original line has been paralleled, the following relationship may be written,

$$\frac{Q_1}{Q} = \left[1+\left(\frac{d_1}{d}\right)^{8/3}\right] \text{---------(4)}$$

That is, when the entire length of the line has been paralleled, the ratio of the volume after paralleling to the volume before paralleling is equal to 1 plus the eight-thirds power of the ratio of the diameter of the parallel line to the diameter of the original line.

When the diameters of the original and parallel line are the same, equations (1) and (2) simplify to,

$$X = \frac{4}{3}\left[1-\left(\frac{Q}{Q_1}\right)^2\right] \text{-------(5)}$$

AND

$$\frac{Q_1}{Q} = \frac{2}{(4-3X)^{1/2}} \text{--------(6)}$$

The percentages of length of line that must be paralleled to give various percentage increases in gas delivery are shown in Fig. 1, which indicates the nature of the relationship expressed by equations (1), (2), and (3). Some interesting factors and comparisons pertaining to the design of parallel systems are brought out by the equations and by the curves in Fig. 1.

The preceding formulas for calculating problems in the design of parallel lines eliminate the numerous computations of the "trial-and-error" methods commonly used. Furthermore, a table or a series of curves similar to those in Fig. 1 (based on the equations presented in this report) will serve the purpose almost as well as calculations made by the formulas and will reduce materially the time required to design parallel lines.

Green Made Permanent Trustee For Middle West Utilities

Daniel C. Green has been made permanent trustee for the Middle West Utilities Co., headquartering in Chicago, Ill. Mr. Green has served as temporary trustee since petition for reorganization of the company under section 77B of the Amended Bankruptcy Act was filed. He also served as president of the utility during the greater part of the receivership period.

W. D. Hostetler Directing Portland Residential Sales

W. D. Hostetler has been appointed manager of residential sales, for the Portland (Ore.) Gas & Coke Co., according to B. H. Parkinson, commercial manager. Mr. Hostetler will have charge of dealer cooperation, cooking schools, home demonstrations, appliance displays and home air conditioning activities.

DISTRIBUTION

Curb Meter Installations

● **F. H. WINSLOW, Southern Counties Gas Co., Los Angeles, Calif., in committee report to Pacific Coast Gas Association Annual Convention, Del Monte, Calif., October 9-12, 1934—(Abstract):**

THE most popular type of curb box is constructed of concrete slabs and assembled on the job. Fig. 1 shows a box for a single low pressure meter setup, made at a material cost of about $5.65. A larger box, to accommodate a regulator alongside the meter, costs about $7.50. This type of construction is convenient and flexible, as shown by the typical installation in Fig. 2.

F. H. Winslow

These boxes rest on bearing blocks, and a crushed rock bottom is found better than a poured concrete floor. An iron cover, painted black, is most satisfactory for vari-colored sidewalks; for under-sidewalk basements a water-tight box cast on the job, or a light weight cast iron construction, is desirable; to withstand heavy traffic, specially poured thick walls are necessary, with a steel top plate.

As regards piping, a variety of arrangements are in use. Welded construction, as in Fig. 2, gives uniformity and minimum leakage at only slightly increased cost. A good paint protective coating is found necessary. Manifolds may be hung from the edge of the box, by hooks, and the meter placed on a non-deteriorating block, such as creosoted redwood.

Cracking of meter index glasses was found to be caused by improper annealing and consequent strains, which could be remedied by the glass manufacturer. Discoloration of the index face and under side of the glass is caused by iron oxide, and can be prevented by painting the interior of the index box.

Regulators present minor difficulties in that the exposed parts corrode, and it is advised to use "Everdur" metal for bolts and nuts and hot dip galvanize the top diaphragm plate. Venting of regulators is difficult and most companies do not attempt it. In cases where water may fill the boxes and get into the regulator, a small hole drilled in both sides of the chamber above the diaphragm, as close to the flange as possible, will drain off most of the water. Regulators may also be installed upside down. Semi-chrome diaphragms are considered better than bark tanned.

Because of corrosion from moisture, bronze or stainless steel springs have been considered, but doubt has been felt as to their fatigue resistance. Accordingly a testing machine was designed wherein springs could be mounted and given a similar motion to that in a regulator, periodically wetted with salt water, and the whole interpreted into years of service. A stainless steel, known as 18-8, was found the most satisfactory, and to have adequate life. Such springs can be obtained for any make of regulator.

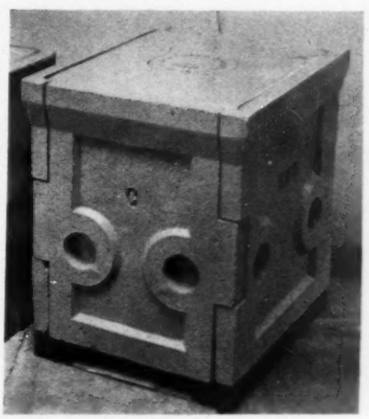


FIG. 1.

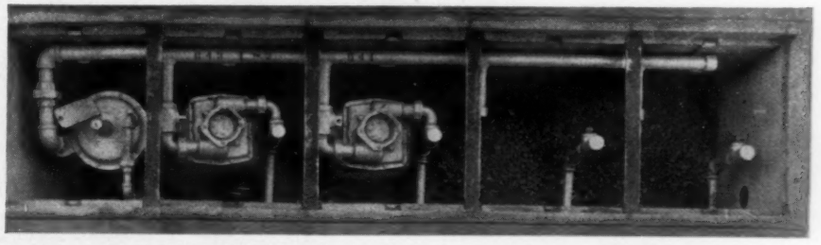


FIG. 2.

Gum Deposits in Distribution Systems

• W. H. FULWEILER, United Gas Improvement Co.; addressing 1934 A. G. A. Joint Committee Conference, Production and Chemical Committees, New York.—(Abstract):

Liquid Phase Gum

EVIDENCED as heavy deposits, of a material that varies from a thick liquid to a hard resinous solid, in meters, often to the extent that the meters will not pass gas. Condensible hydrocarbons in the gas were suspected, and a method developed for the quantitative recovery of these hydrocarbons, and their examination with respect to potential gum formation. Two fractions were indicated as being responsible for gums—a low fraction up to 80° C., and a high fraction from 120 to 200° C. The important hydrocarbons in the former were disclosed as butadiene and cyclopentadiene, and in the latter as styrene and indene. Further studies, in comparison with natural formed gums, showed that styrene and indene account for not less than 70-80 per cent of the hydrocarbons present and that the low boiling hydrocarbons are not present in appreciable proportions.

A study of the various factors controlling the gum formation disclosed that the gum is essentially a polymerization and oxidation product of indene and styrene; there is about four times as much indene as styrene; oxides of nitrogen are not essential constituents; formation is only in the liquid phase; its rate of formation is greatly increased by higher percentages of oxygen in the gas; the presence of small quantities of mercaptans strongly catalyze the formation; the formation can be inhibited by the presence of mono- or polyhydric phenols.

Investigation of the possibility of reducing the amount of indene and styrene by varying the operating conditions in the manufacture of carburetted water gas soon indicated that complete elimination was impracticable, and that even with the most efficient operating conditions more styrene and indene are formed than is required to saturate the gas at ordinary condenser temperatures.

Inasmuch, however, as these compounds have relatively high boiling points, considerable elimination can be had by using low condenser temperatures, or even refrigeration, or by compression with adequate after-cooling.

With respect to the possibilities of oil scrubbing, it was determined that styrene and indene can be removed to any desired extent by the same apparatus and processes employed for the recovery of light oil or the removal of naphthalene. Light condensibles would be removed at the same time, with consequent reduction in B.t.u. Sufficient removal of styrene and indene to prevent condensation at 0° C. would result in a loss of from 2.5 to 13 B.t.u.

Considerable work was done on the reduction of the oxygen content of the gas. This expedient is complicated by the necessity of oxygen in the gas for the revivification of the iron oxide purifying material. It was found, however, that it is not at all necessary to operate with large percentages of excess oxygen in the gas and that quite satisfactory purification with iron oxide can be secured with oxygen percentages that do not exceed 0.4 per cent. The reduction in the oxygen content is one of the first steps that should be taken where trouble is being experienced with liquid phase gum.

As it was shown that mercaptans were very active catalysts in gum formation, it is obvious that removal of organic sulphur would be beneficial. It is believed, however, that sulphur removal processes cannot compete with proper condensation, in operating costs.

As a result of this research a marked improvement in the meter situation in Philadelphia has been attained. Considering the 1925 meter operating data as 100 per cent, the "won't pass gas" meters have been steadily reduced to 8.7 per cent in 1933, the "cease to record" meters to 18.5 per cent; the weighted average error of meters tested has dropped from 2.59 per cent slow in 1929 to 0.50 per cent slow in 1933.

Vapor Phase Gum

Consisting of small gummy particles that are carried with the gas stream and deposited on needle valves and other orifices to cause stoppage. The formation of these gums is caused by the presence in the gas of nitric oxide, NO; a very delicate method has been developed for the determination of this NO, and a continuous recording apparatus built and in operation.

In connection with the deposition of this gum, it is now believed that the first material that is deposited is a white crystalline substance that should be fairly pure and probably of fairly definite composition. This appears to spontaneously change over into a yellow amorphous material which is the typical vapor phase gum that is normally seen.

So far no method has been developed that will consistently give better results than properly operated oxide boxes at a comparable cost. Continued operating results appear to indicate that with operation of oxide purifiers in accordance with formerly described procedure, with possibly the addition of 15 to 25 per cent more purifying space in some situations, the NO in the outlet gas can be maintained at a sufficiently low figure to secure practical freedom from stoppages due to vapor phase gum. The maximum permissible amount of NO is still somewhat in doubt, but is possibly equal to 2 grams per million, or 0.003 grains per 100 cu. ft.

Welding Copper Alloys

• R. L. COOK, Southern California Gas Co., in report to Technical Section, Pacific Coast Gas Association.—(Abstract):

RECENT developments in the field of welding copper alloys, developing strengths equally as great as medium carbon steel, must not be overlooked by the gas industry. Copper is unique among metals in that it may play two important parts in welding: (1) Copper and copper alloy welding rods are used extensively in the joining of cast and malleable iron, and wrought and cast steel. (2) These rods are also used for the joining of all copper and its alloys, such as brass, bronze, nickel-silver, and monel metal.

R. L. Cook

Copper, the chief constituent of those alloys to be considered in this discussion, has a tensile strength of 20,000 pounds per square inch when cast, 30,000 pounds when forged or 60,000 pounds when cold worked.

There are two kinds of copper as determined by the impurities contained. These are electrolytic and deoxidized. There is always .03 to .07 per cent of cuprous oxide remaining in electrolytic copper.

Welds made from this material are greatly weakened by this oxide spreading out along the grain boundaries and may be expected to reach only a tensile strength of 15,000 to 18,000 pounds per square inch.

Deoxidized copper is further purified by the use of deoxidizing agents in the molten bath. This makes a material which welds easily and will have a strength nearly twice that of electrolytic copper. Therefore, it is advisable to use deoxidized copper where mechanical strength of the weld is desirable.

Due to the high thermal conductivity of copper, considerable difficulty may be encountered by the welder familiar with iron and steel welding alone. This rapid heat transfer makes it necessary

frequently to raise the temperature to a red heat an inch or so away from the edges before fusion begins. This makes it difficult to use the metal arc without pre-heating the base metal. It also follows that full advantage cannot be taken of the high heat concentration in either the metal or carbon arc.

Considering now some of the alloys of copper which improve the characteristics mentioned above, the two main classes being bronzes and brasses: Bronzes are alloys consisting mainly of copper and tin, with copper ranging from 60 to 95 per cent. Brasses are alloys having copper and zinc as their main constituents, with copper ranging from 50 to 93 per cent.

Two well-known bronzes are Tobin and Manganese. The former has been in use a number of years. It consists of copper 60 per cent, tin 1 per cent and zinc 39 per cent, has a melting point of 1625° F. and a tensile strength of 55,000 pounds per square inch.

Manganese bronze has a very similar composition to that of Tobin, but includes about 1¼ per cent of iron and a small amount of manganese. Its melting point is about 30° lower than that of Tobin bronze and it has a tensile strength of about 6,000 pounds greater. It is safer for use on malleable iron, for these reasons, although it is much harder and less ductile.

Tobin and Manganese are both very serviceable where dissimilar metals are to be joined, such as steel and cast iron, copper, monel metal, high carbon and low carbon steels, etc. They are not suitable for use with the electric arc because the great heat and attendant lack of protecting gas quickly melts and burns out the zinc. The oxy-acetylene flame is adapted to the brazing process with weld rods of these materials.

Rods high in tin content are suitable for use in arc welding, for, while the melting point of tin is low, the boiling point is high and the tin remains in solution.

Rods containing silicon or manganese, or both, make excellent arc welding electrodes.

Phosphor Bronze rods in general have three different tin contents, 4-5 per cent, 7-8 per cent, and 10-11 per cent, all of these being suitable for deposition on steel or cast iron with the metal arc. A curious feature, however, is the fact that better deposits are obtained on steel with reverse polarity and on iron with straight polarity.

So far the discussion has been more of brazing than fusion welding. The latter is necessary when steel is welded to gain strength in the weld approaching that of the parent metal. Many times in copper alloy welding the strongest possible weld is obtained when the rod is fused onto the base metal when the latter is only raised to a dull red heat. This is very desirable frequently when considered from the standpoint of the effect on the base metal. There is a lessened tendency to produce distortion and shrinkage strains or cracks.

A recent development is Everdur, a patented copper, silicon, and manganese alloy of the solid solution type. It has a tensile strength of from 50,000 pounds to 85,000 pounds, is highly resistant to corrosion and may be fusion welded by using the same rod and with the usual methods.

The silicon in the alloy relieves the copper of any unsoundness by eliminating oxygen and driving off any hydrogen occluded during the melting.

Best results in welding Everdur are obtained by using a flux of 90 per cent fused borax and 10 per cent sodium fluoride. It is necessary to use a backing bar. The oxy-acetylene flame should be slightly oxidizing to prevent the possibility of absorption of carbon monoxide and the formation of a porous well. This material welds very rapidly by either method, greater speed being attained by arc welding, but greater ductility with the acetylene flame. Properly made welds with this metal will develop strengths of from 55,000 to 60,000 pounds per square inch. With tensile strengths such as this it is easily conceivable that many of our fittings and even pipe lines may be built from this or similar alloys in the near future.

UTILIZATION

Pilot Lights

● GUY CORFIELD, Los Angeles Gas and Electric Corp., Chairman Pilot Lights Committee; in report to Annual Convention, Pacific Coast Gas Association, Del Monte, California, October 9-12, 1934—(Abstract):

Analysis of Customer Complaints

A special investigation of pilot light difficulties was made by the Southern Counties Gas Co. of California to determine what proportion of the total number of consumers complaints are caused by faulty pilot operation, and the relative importance of the various causes of pilot troubles. It was disclosed that approximately 20 per cent of all complaints are due to pilots; that the appliances adjusted were: ranges 44 per cent, water heaters 39 per cent, furnaces 9 per cent, gas refrigerators 1.4 per cent; that the lighting pilots on water heaters and furnaces are the most unsatisfactory, being generally of poor design and often improperly located, causing delayed ignition and extinguishment; that safety pilots account for 22.5 per cent of all pilot troubles; that dust and internal corrosion are responsible for 22 per cent of pilot difficulties; that only 2.5 per cent of the troubles could be traced to pressure variation; that men should be especially trained for pilot adjustments so that repeat calls can be reduced to the minimum.

Orifice Shape vs. Stoppage by Impurities

It is the opinion of all contributors that a circular fixed orifice most effectively resists stoppage by impurities, by allowing the particles to pass through the orifice harmlessly. The conventional needle valve, with its narrow annular orifice which is often less than 0.001 inch in width, is very susceptible to stoppage. The same applies to a plug cock, unless the opening in the barrel is very small and approaches full opening when used as pilot control. Change or adaption to circular opening should be made whenever possible. Fig. 1 shows a simple conversion of a needle valve assembly to circular fixed orifice.

It is desirable to have a very short orifice, such as could be drilled in a thin plate or disc, rather than one taking the form of a channel. A funnel approach

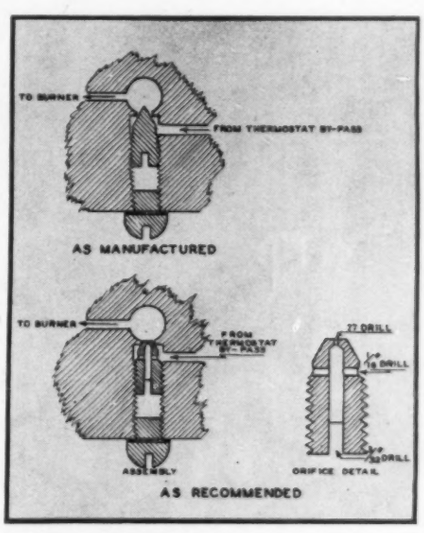
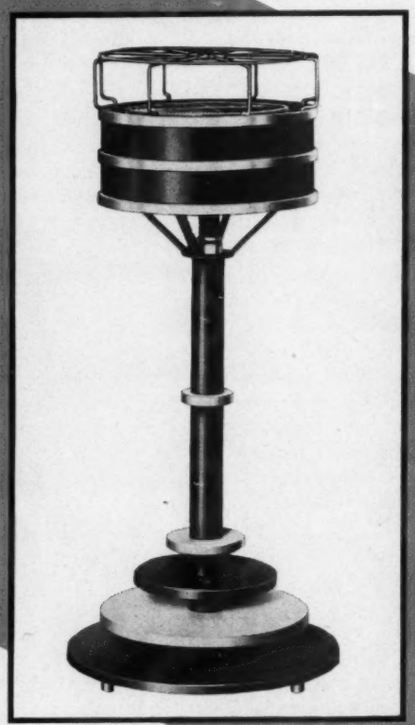


FIG. 1.

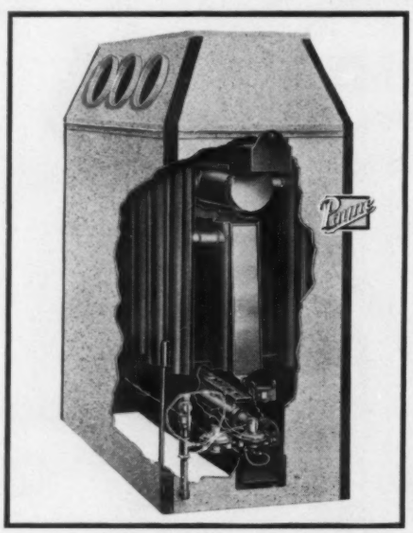
Payne

Leads in Modern Gas Appliances



New Payne Modern Console Heater

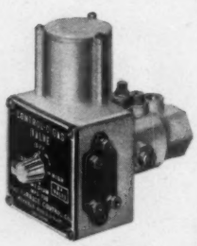
This NEW, attractive product of the Payne Factory is not only exceedingly beautiful in design and finish, but lends itself to a wide range of installation possibilities. Approved for use with or without vent. It can be operated manually or with thermostat. Three sizes now available for installation in homes, offices, schools and other buildings where no basement is available.



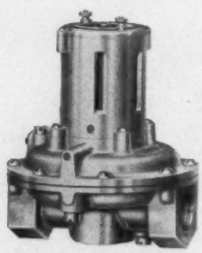
The Payne line of basement type furnaces is known throughout the entire country and the many thousands of satisfied users can attest to their Economy, Durability, Beauty and Dependability.

Payne Moderne Pedestal Heater

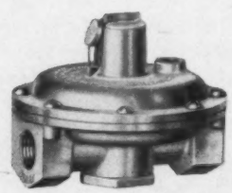
A NEW Heater designed for use in eliminating "cold spots" and for heating limited space such as bath rooms, den or small living room, office, etc. Following a Modern design, finished in satin black and chromium, its ease of installation and low cost make this an ideal appliance for volume sales.



Control-O-Gas Three Degree Valves are recommended as the proper type to be used where remote operation of various temperatures is desired.



Control-O-Gas Thermo Valves should be used where constant automatic temperature is required. Sturdy construction and trouble free. Balanced in all cases with Payne products.



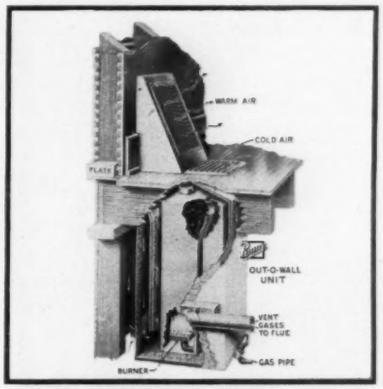
Control-O-Gas Low Pressure Regulators are standard equipment on all Payne basement and floor type furnaces. Set at factory. No adjustment necessary.

Heat

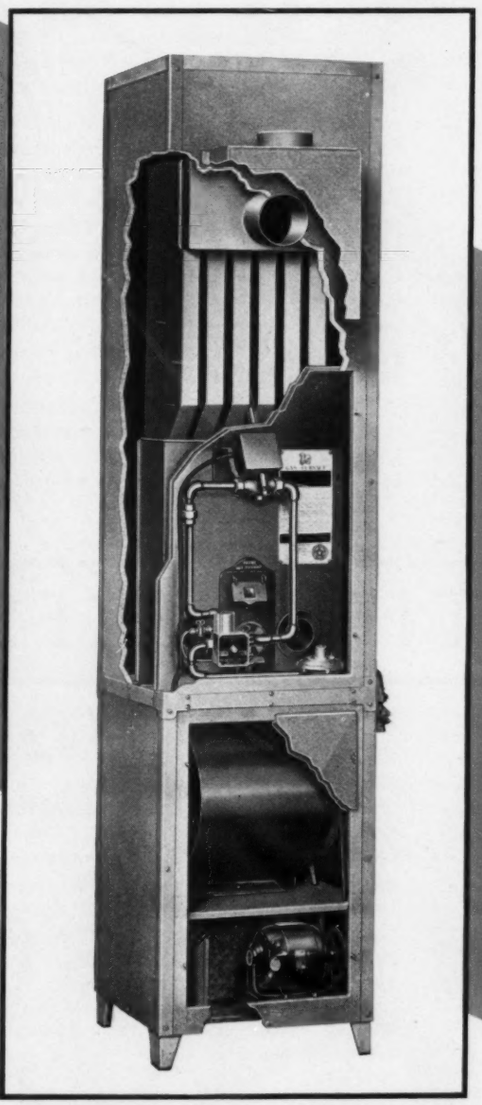
Results Are Best With Payneheat

A Forced Air Unit for Volume Sales

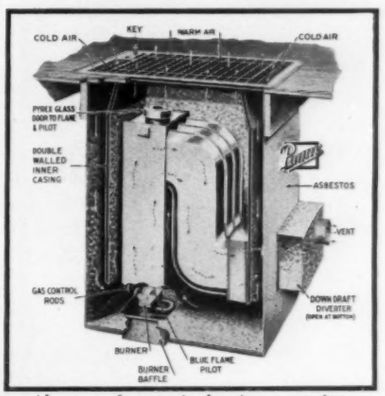
Unequaled by any similar product now on the market, the Payne "FAU" Furnace is the most complete and compact forced air unit made. A gas-fired furnace of 90,000 B.t.u. input rating combined with a blower and control equipment, all contained in a small and compact casing. Designed for installation in limited space and where no basement is available. Installation extremely simple and cost moderate. This Unit should be of especial interest to new business executives.



Payne Single Register Furnace. No cutting of wall. Installed like floor furnace. A big seller and a good load builder.



Write at once for Payne Catalog No. 34 which gives all the details of these superior products.



Always a feature in heating campaigns, the Payne Floor Furnace brings satisfied customers and added revenue.

Each A Leader

In its separate field each product of the Payne Factory is a leader—Related in that they are designed for use with gas—the ideal fuel—they offer a solution to the problems of the merchandising Departments of every gas company. You should get the facts regarding the complete line, which includes also—METAL-BESTOS—the perfect pipe for venting all gas appliances.

PAYNE FURNACE & SUPPLY Co.

BEVERLY HILLS CALIFORNIA

Warehouse Stocks also in San Francisco · Denver · Dallas · Atlanta · Buffalo · Boston

should be avoided; the angle of approach should be not less than 90 degrees.

Filters to Remove Dust

In developing filters to remove dust from the gas the extreme fineness of this dust must be realized, and all possibility of by-pass avoided. It was found that one-quarter wool felt makes a good filtering medium, but in fabrication into thimble or conical shape it must be glued rather than sewed, as dust will pass through the needle holes. An area of 30 square inches of this felt will permit of passage of 100 cubic feet of gas per hour with less than one-tenth inch (water column equivalent) of pressure drop.

Stoppage Due to Hydrogen Sulphide

In one Southern California territory great difficulty was encountered from stoppage in brass and copper pilot tubes and tips, and it was disclosed as being caused by hydrogen sulphide, in quantities less than 4 grains per 100 cubic feet, attacking the copper and brass whenever passing through or located in heat zones, and rapidly building up copper sulphide to the point of stoppage. Research to discover metals resistant to hydrogen sulphide attack showed that aluminum was satisfactory, and the recommendation is made that aluminum tubing be used instead of copper, for pilot tubing and tips, wherever the presence of even slight traces of hydrogen sulphide is suspected or disclosed, and the tubing will be subject to heat. Adequately annealed aluminum tubing is necessary to avoid breakage at compression joints.

Pilot Combustion and Construction

There was a majority but not unanimous agreement among members that the blue flame pilot is superior to the yellow flame, from the standpoint of resistance to extinguishment by up, down and side draft, and concussion. The multiple or slotted port is more in favor than the single port flame seat.

Effect of Fluctuating Pressure

A series of tests on the effect of fluctuating pressure on the performance of standby, ignition and safety pilots on clock control gas ranges showed that a change in pressure of 2 inches above or below the standard service pressure had no harmful effect. This adds further to the finding already given that moderate service pressure fluctuation is a negligible cause of pilot difficulty.

Field Adjustments

A study of field adjustments points to the desirability of a service personnel thoroughly trained and capable of diagnosing the various causes of trouble that may arise; also the desirability of cooperation between manufacturers, installation crews and gas companies so that faulty design and installation may be corrected and avoided.

Sampling Carbon Monoxide in Combustion Products

● J. M. NORTH and N. K. SENATOROFF, Los Angeles Gas and Electric Corp.; in report to Chemical Laboratory Methods Committee, Pacific Coast Gas Association, June, 1934; topic, "Sampling and Storing Flue Products Containing Carbon Monoxide"—(Abstract):

IN working out a method for the sampling and analysis of combustion products from gas appliances, with respect to the presence of carbon monoxide, a procedure was developed whereby the products were sucked through a metal funnel, and a length of rubber tubing, by a rubber aspirator bulb, and pumped into a small rubber bag (gas main stopper) for transportation to the laboratory for analysis. Inasmuch as the iron funnel became quite hot it was thought possible that the carbon monoxide might become oxidized. It was also suspected that the carbon monoxide in the rubber bag might become absorbed, or selectively diffuse through the pores of the rubber, if allowed to stand for an appreciable length of time. The report describes tests along these lines.

To determine the sampling temperatures encountered with respect to the sampling funnel and tube, thermometers were inserted in the tube in various places and typical sampling procedure followed out. It was found that only by bringing the funnel unnecessarily near to the flames could temperatures in excess of 450° F. be obtained.

An apparatus was then set up whereby combustion products containing a known percentage of carbon monoxide, from a reservoir, could be passed through an iron tube heated to a known temperature, and subsequently analyzed (by continuous carbon monoxide indicator) to see if the composition had changed. It was found that at temperatures at or above 500° F. a slight lowering in carbon monoxide concentration was effected, but at lower temperatures no change was shown.

A large rubber bag was filled with flue gas containing 0.018 per cent carbon monoxide. After seven days storage in the bag the contents analyzed 0.015 per cent. After seven more days the contents still analyzed 0.015 per cent, indicating that no further change was taking place. A second bag containing 0.06 per cent carbon monoxide was tested every day for five days and remained unchanged in composition.

It was therefore concluded that this method of sampling and temporarily storing combustion products containing carbon monoxide was permissible.

DOMESTIC SALES

A Program for Domestic Water Heating Sales

● A. F. RICE, H. R. Basford Co., San Francisco; Chairman, Water Heating Committee, Domestic Division; in report to Pacific Coast Gas Association at Annual Convention, Del Monte, Calif., October 9-12—(Abstract):

THERE is no "style value" nor popular appeal to hot water and the hot water heater is therefore at a disadvantage when competing with alluring appliances such as ranges and refrigerators; manufacturers have been unable to write in promotional expense in the cost structure, and large mercantile institutions are not attracted by this class of business. From the utility standpoint, however, the automatic gas fired water heater load and revenue are extremely valuable, and the committee is of the opinion that it is squarely up to the utility to support sales promotion of this type of appliance. The following suggestions are made.

Utility Sales Cost: Financial support should be given, the minimum amount necessary being equal to the first year's revenue.

Capacity, Quality and Price: Utilities and manufacturers should adopt the policy of pricing all storage heaters of less than 20-gallon capacity, in the same model or family group, at the same price as a 20-gallon heater in the same

group, thus insuring sale of small capacity heaters only when necessary. Limit active promotional efforts to a priced line of which a 20-gallon storage heater, including adequate connection charges, sells for not less than $60.00 connected (on the basis of present market values).

Competitive Fuel Recognition: Where competitive fuels offer equal service at lower cost, the obvious recommendation is intelligent rate adjustment, the uppermost thought being to provide for abundant, rather than limited, use of hot water, the strength of appeal lying in adequate quantities. The guaranteed bill "flat rate" service, and the "limited type" heater on a special "flat rate" are suggested as effective methods. Limit recovery heaters should provide recovery of 20 gallons per person, per day, of a fixture outlet temperature of not less than 135° F. Storage capacity of such type heater should be: for two persons, 30 gallons; three or four persons, 45 gallons; five or six persons, 60 gallons.

Public Understanding of "Automatic Hot Water Service": It is felt that a large percentage of the public hold the belief that any means of heating water other than by kettle, tub or coil is an "automatic" means, and that they are up to date if in possession of manually operated tank or combination heaters. To arouse public interest in a "new" device, more illustrative or graphic terminology should be coined, and such terms as "self action", "self controlled" or "thermostatic" be applied to the modern water heating devices.

Employee Education: It is suggested that employees of dealers, utilities and manufacturers be educated in the presentation of sales points and buying motives to stress the advantages of unlimited and instantly available hot water.

Specialty Salesmen or Bonus for Sales: It is recommended, with the conviction of need for specialized attention, that where the field permits, utilities operate special sales crews with their activities confined to automatic gas-fired water heaters. If this cannot be accomplished, it is imperative to immediately establish a sales remuneration or performance bonus plan that will give sufficient credit to automatic water heater sales to offset the natural centering of interest around the easier sold and hence more interesting appliances.

Home Economist Support: Full appreciation of flowing hot water will never develop until all the valuable usages of hot water are understood by individual owners. Home economics departments should establish a "routine" program for home calls; one that is an interesting portrayal of the more than 200 definite uses of hot water in the home, which require resort to the hot water faucet 50 to 150 times each day.

"Saves Cost" Appeal: It is recommended that "self action" water heaters be presented and sold on the basis that the product they provide, "hot water", at a comparatively lower cost per gallon than manual methods, is manifestly capable of performing services for the user that offset the cost of the heater in such a reasonably short time that its purchase can be made out of the household budget and then, upon completion of payment, this sum will be a "saving" or "extra money". Detailed analyses are made of these "savings" of average families, among the figures deduced being: 15 per cent saving in laundry costs; 10 to 25 per cent increase in wearing life of apparel; $10.00 saved annually in personal hygiene, $6.00 in beauty treatment; five hours per week of housemaid's work eliminated; annual total saving for three-person family, $79.09.

Contribution to Dealer Advertising: Manufacturer and utility should contribute to dealer advertising, the manufacturer's contribution not exceeding 5 per cent of its selling price to dealer, and the utility contribution not exceeding 33-1/3 per cent of dealer's actual advertising cost.

Window and Floor Display: At least 25 per cent of available display floor space should be devoted to water heaters during normal periods. During campaign periods, where such are devoted solely to water heaters, display space should be dominated by background and heaters to the extent of leaving no doubt that water heating is the thing of the moment. Active running hot water displays are essential, and should be provided.

Sales Plans: Water heaters are favored by no "seasonal" demand, to naturally focus public attention on the water heating problem. One yearly campaign is therefore not enough, and twice yearly is submitted as a reasonable minimum.

Whatcom Natural Gas Co. Extensions

Whatcom Natural Gas Co., Bellingham, Wash., will soon begin service of natural gas to the Whatcom County Home, and to 62 residences in the area. Laying of the service line to the county farm and private homes was to start some time in October, according to C. S. Shippey, president of the company.

Municipal Service for Saco

The Saco, Mont., city council is making preliminary plans for the construction of a municipal natural gas system, for which supply will be obtained from the new 500,000 cu. ft. well just outside of the city limits.

Gas Range Sales and Service Practice

● J. EARL JONES, Seattle Gas Co., Chairman, Gas Range Committee; in report to Annual Convention, Pacific Coast Gas Association, Del Monte, Calif., Oct. 9-12, 1934—(Abstract):

THIS report consists of a summary of answers received from 17 Pacific Coast gas companies on questions related to sales and service of gas ranges.

J. Earl Jones

Range Service: All companies furnish generous adjustment service on gas ranges regardless of place of purchase, and cooperate closely with dealers to satisfy customers. Some dealers give a limited amount of free service; others refer all customer service requests to the gas companies; practically all dealers turn over the more difficult adjustment and replacement requests to gas companies. On replacement parts, six companies charge actual material cost only, and 11 charge for both materials and labor; eight add overhead ranging from 10 per cent to 50 per cent to actual cost of labor and materials. Some companies make periodic inspections to anticipate complaints.

Gas Savers: The active sale of "gas savers" is most prevalent in the larger cities. The most effective weapon against these savers is in the education of salesmen, service men and dealers in the fallacies and hazards involved.

Home Service: There has been a definite trend among the gas companies toward more effective home service activity. While only about one-half of the member companies maintain active home service departments, nearly all cooperate with local newspapers and other agencies sponsoring cooking schools and home economics programs. Several companies are giving special attention to demonstrating clock controlled ranges in customers' homes. A few company home service departments are featuring luncheon club demonstrations to women's groups.

Kitchen Planning: Two of the 17 companies engage in some form of kitchen planning service. Several have expressed interest in this new form of promotional effort, and most give some consideration to kitchen planning through contact with architects and fur-

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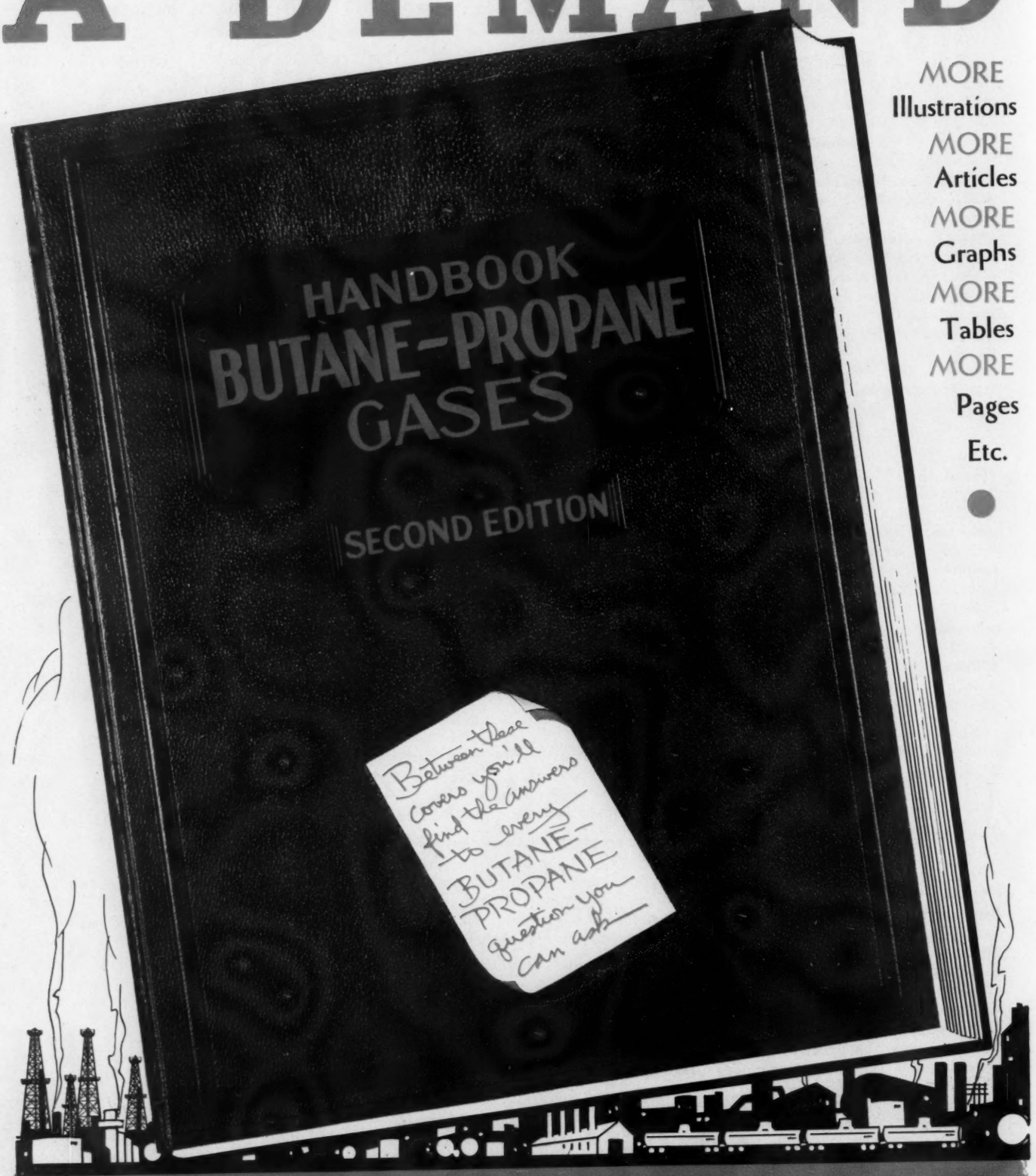

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2nd EDITION

DETAILING THE REVOLUTIONARY DEVELOPMENTS OF THE PAST TWO YEARS!

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SUMMARY OF DEVELOPMENTS: Brief review of progress during past two years since publication of first edition, including foreign expansion, new industrial uses, new manufacturing sources, new plant and equipment design, etc.

USE IN INTERNAL COMBUSTION ENGINES: A comprehensive discussion of liquefied petroleum gases in this important new use including engine design, comparison of propane and butane with other fuels, use in stationary engines, block testing automotive engines; use in rail cars, trains and locomotives; use in automotive engines; refrigerator cars and trucks; dirigibles and aeroplanes; utilization equipment such as carburetors and mixers, vaporizers, fuel tanks, valves and fittings, etc.; consideration of safety in relation to internal combustion engine use of these gases.

DESIGN AND INSTALLATION OF STORAGE: A basic chapter analyzing the several codes now applying to liquefied gas storage, including the National Fire Protection Association Rules, A. P. I. Pressure Vessel Code, California Liquefied Petroleum Gases Safety Orders, proposed California pressure vessel safety orders, etc. Fundamental discussion of good design practice touching such phases as determination of working pressure, design of shell, design of heads, reinforcement of openings, fabrication of vessel; shop inspection and hydrostatic tests; emergency relief provisions. Separate discussion of installation for permanently installed vessels (above ground); underground storage; skid tanks; fuel tanks for tractors and trucks. Also sections on piping for butane tanks, gauging methods, protection of gauging and emergency relief devices.

SUPPLY FROM PETROLEUM REFINERIES: Characteristics of refinery gases with reference to liquefied gas production. Detailed discussion of oil absorption and compression processes for liquefied gas recovery; fractionating columns; extraction of ethane from refinery vapor.

ENGINEERING DATA ON THE LOWER OLEFINS: A basic reference chapter consisting of tables on properties of liquefied petroleum gases produced from petroleum refineries; a companion chapter to that in the original Handbook on properties of the natural-gas-produced liquefied petroleum gases.

DOMESTIC APPLIANCE TESTING AND UTILIZATION: Separate discussions of undiluted and carbureted gases from the standpoint of their burning characteristics. Appliance testing procedure on liquefied petroleum gases, with special reference to American Gas Association methods. Fundamentals of appliance design for proper use of these gases. Latest A. G. A. Laboratory Approval requirements. Standards of construction and performance for gas appliance accessories.

COMPETITIVE POSITION OF THE LIQUEFIED GASES: Economic comparisons, illustrated by ready-reference charts, comparing liquefied gas costs with cost of electricity, kerosene, oil, manufactured and natural gas, coal, etc.

TOWN PLANTS: A new chapter combining discussion of butane-air and undiluted types of plants. Written from a practical operating standpoint and giving latest information on new plant equipment as well as present trends in over-all plant design. A section is included on fundamentals of distribution design, plant operating problems, etc.

MANUFACTURE FROM NATURAL GAS: A new chapter dealing with the natural gasoline plant process, with special reference to operations involved in liquefied gas recovery. Flow diagrams assist in presentation of plant processes.

SPECIAL USES: Orchard heating, construction camp use, and various special applications such as cutting and welding.

SUPPLEMENTS AND REVISIONS

A number of chapters in the first edition have been retained for the second edition, with additions and modifications made by their original authors to bring them in line with present knowledge. Late information will be found in the Handbook on:

TRANSPORTATION: New material on motor truck and trailer design, describing typical equipment in use, pumps for loading and unloading, etc.; current railway freight rates; requirements for shipping by water, etc.

USE WITH OTHER GASES: An added section on standby gas, also further discussion of reforming, use of propane for underfiring coke ovens, and use of butane or propane with coal gas under peak load conditions.

ANALYSIS AND TESTING: Specifications for commercial grades, test procedure for determination of specific gravity, water content, vapor pressure, etc. The above and other additions have been made to the chapter on Composition and Analytical Determination.

PROPERTIES OF MIXTURES: Additional curves have been drawn including those on dew points of butane, propane, and typical mixtures, carbureted with air; curves showing relation between B.t.u. and specific gravity.

BOTTLED GAS DISTRIBUTION: This chapter has been brought up to date, with sections on foreign sale of bottled gas, present trends in bottled gas merchandising, new types of service equipment being developed.

BIBLIOGRAPHY: This valuable feature of the first edition has been extended to list worthwhile material published during the past two years.

CENTRAL PLANT DIRECTORY: A new town plant directory numbering all operating plants as well as several to be constructed in the future; will give information secured directly from the companies on plant location, number of meters, type of service, plant capacity, rates, etc.

CATALOGUE SECTION: Current detailed engineering information on the many products now manufactured for special service on butane and propane.

BUYERS' GUIDE: Revised commodity listing of firms supplying equipment, appliances, or services for the liquefied petroleum gas industry.

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niture store dealers. Certain range and appliance manufacturers have published suggested kitchen layouts.

Salesmen Education: About half of the companies conduct regular classes for the training and education of range salesmen. The A. G. A. Domestic Salesmanship Course for Range Salesmen has been most generally used. One large utility has not only given its salesmen a course of instruction in the art of cooking but has also taught the salesmen service work in the distribution department.

Employee Selling: A variety of educational methods for training general employees are used by member companies. Regular meetings are employed to give instructions to general employees on the use and construction features of ranges. Bulletins containing useful information and encouragement to employee salesmen are commonly used. Selling contests with substantial prizes are offered from time to time.

Architects: There is an apparent lack of constructive effort through architects. Only six of the 17 reporting members are doing positive cultivation work with local architects. Ten companies report that they are making personal contacts with architects, principally through salesmen. The remainder are apparently neglecting this important trade contact field.

Cooking Competition: The average rate for gas cooking ranges from 60c per M c.f., 1100 B.t.u. natural gas, to $2.37½ per M c.f. for 500 B.t.u. manufactured gas. Electric rates for cooking vary from 1c to 3½c. The ratio of gas cooking cost to electricity covers a wide range, from .95-to-1, to 1-to-5, or from equal cost to electricity cooking five times more expensive than gas. These ratios are based upon tests conducted in Seattle and later in Los Angeles proving that 10,000 B.t.u.'s in gas are equivalent to 1.4 kw. hrs. Only one utility has felt any strong stove oil competition for residence cooking, the average quantity prices being from 10c to 12c per gallon.

Advertising: Newspaper advertising headed the list by a wide margin. Direct mail, poster boards and miscellaneous were approximately equal in weighted average percentages. Radio occupied fourth place while screen or theatre advertising was given no position among the questionnaire preferences. Under miscellaneous, special hand bills and cooking schools were given first and second preferences respectively.

Selling Inducements: There is a definite trend among utilities toward longer terms of payment. The majority use one-half of 1 per cent per month as a carrying charge which is equivalent to 12 per cent per annum on the unpaid balance. Two utilities use the 8 per cent per annum financing charge. Practically all companies sell ranges on a 10 per cent down payment basis. The majority of companies offer a maximum trade-in allowance equal to 10 per cent of the net sale of the new range. A few companies limit the trade-in to $10 flat allowance. Others offer a larger campaign trade-in allowance as a means of getting rid of old and obsolete ranges.

Dealer Cooperation: Twelve companies sell actively, two sell in part of territory and under certain restrictions, three do not sell directly at all. Practically all lend active cooperation and assistance in range selling and advertising to local dealers. Utilities selling directly seem to offer quite as much active cooperation with dealers as those utilities which do not sell ranges directly. The most successful campaigns in range sales have resulted from uniform special offers participated in by utilities, dealers and manufacturers. This plan of cooperative selling has invited substantial advertising appropriations and has encouraged worthwhile selling inducements being offered to customers.

Salesmen's Compensation: The two utilities paying straight salaries to salesmen are not engaged in active range selling. The salary and commission, or salary and load building bonus plans of compensation are by far the most popular. Several companies allow their salesmen full or part commissions on sales promoted through dealers as well as company sales. There seems to be a definite trend toward paying load-building bonuses, giving preference to those appliances which offer the most valuable gas load to the company.

PLANT PRACTICE

Purification of Gas Works Waste Water

• **A. C. TAYLOR, President, Consumers Gas Co., Reading, Penna.; addressing 1934 annual convention, Canadian Gas Association; topic, "Purification of Gas Works Waste Water"—(Abstract):**

THE Consumers Gas Co. is under the necessity of purifying waste water before discharge into the Schuylkill River, 55 miles upstream from Philadelphia, the contaminant being suspended tarry matter which still remained in the effluent from the tar separator. Experiments disclosed that if the water were alkaline, or made slightly alkaline with soda ash, the addition of copperas would cause a precipitate of iron hydrate, presenting a large surface on which the tarry matter would deposit, with subsequent deposition of both tar and iron hydrate in the bottom of settling tank. This would leave a clear water, slightly yellow colored from iron, but not objectionable.

The practical installation consists of a large elevated concrete tank, divided into three compartments by concrete partitions, and two large filter tanks at ground level. The three elevated settling or treating tanks are 10 feet x 12 feet x 6 feet deep and the filter beds are each 15 feet square x 5 feet deep. These filter beds contain three layers of material, two of coke and one of Jersey gravel. The bottom layer is 1 foot thick and contains 4 tons of egg-size coke; the second layer is also a foot thick and contains 4 tons of small coke; the third and top layer is 14 inches thick and consists of 12 tons of Jersey gravel or coarse sand.

The overflow from the filter beds discharges into the river through a French drain of 6-inch terra cotta pipe with open joints and several open end laterals. This main drain line is approximately 65 feet in length and is laid through a cinder fill which gives an additional filtering action to the effluent before it finally reaches the river.

The operation is as follows:

The water from the last compartment of the tar separator is delivered into one of the three settling compartments. At the same time the predetermined amounts of copperas and soda ash are introduced. After the first tank is filled the water is allowed to settle. After sufficient water again collects in the last compartment of the tar separator, the second tank is filled. After the second tank is filled and while the third is being filled, the water from the first tank, which in that time has become fairly free from suspended matter by settling, is permitted to run into one of the two filter beds. Only one of the

filters is operated at a time. The other is held in reserve to be used either in an emergency, such as an overtaxation of the system due to heavy rains, or while the one filter is being cleaned. Through a third connection, approximately at the bottom of each tank, the sludge which accumulates may be drained back into the tar separator through the pumping main. Each of the three compartments has an effective capacity of 2,700 gallons, which, if it is necessary, can be increased to 3,500 gallons. Each is provided with a wooden baffle to retain in the tank any light oil or light tar floating on the water, which is skimmed off from time to time.

In normal operation it is necessary to drain the sludge from the settling tanks back into the tar separator once or twice a week, according to the density of the material being filtered. The life of the filter likewise varies considerably, depending upon the condition of the water being treated and the efficiency of the operator. With proper care, such as scraping the fouled sand off the top and replacing with an inch or two of fresh sand or gravel every two weeks, the bed can be used from three to five months. However, at times when considerable tar emulsion exists, it is necessary to clean the entire filter after only a few weeks of service. This operation requires about 75 man hours.

The filters when new have a capacity of 1,700 gallons of water per hour. Allowing 1½ hours to fill the tanks, 5 hours to settle and 1½ hours to run through the filter, the system is capable of handling 24,000 gallons of water per day. In this plant there is treated not only the water that has come in contact with gas and tar, but also all of the drainage water from the yard and works holders, which places a heavy duty on the system during rain storms. In such an emergency the reserve filter can be used and the time required for filtering and settling reduced to less than half, which increases the capacity of the system to 40,000 or 50,000 gallons.

This apparatus has given very satisfactory service and at no time has any objectionable matter been discharged into the stream, but it does require careful supervision on the part of the operators.

PWA Loan Approved by Houston for Magnolia Park Plant

The Houston, Texas, city council late in September, formally approved an agreement between the city and the Public Works Administration, whereby the PWA will furnish $92,300 for the rehabilitation of the Magnolia Park gas plant and distribution system, owned by the city. The loan was requested some time ago but was only recently approved by the PWA at Washington.

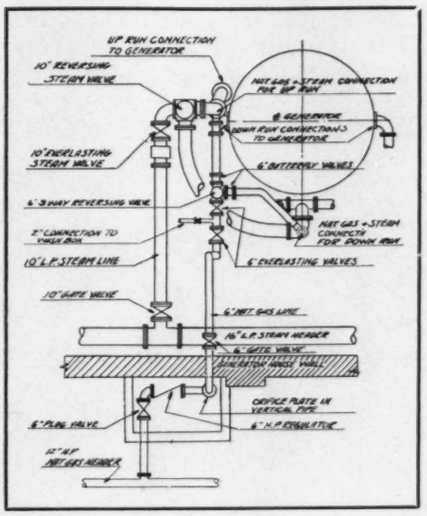

UP RUN CONNECTION TO GENERATOR
10" REVERSING STEAM VALVE
HOT GAS + STEAM CONNECTION FOR UP RUN
GENERATOR
DOWN RUN CONNECTIONS TO GENERATOR
10" EVERLASTING STEAM VALVE
6" BUTTERFLY VALVES
6" 3 WAY REVERSING VALVE
2" CONNECTION TO WASH BOX
HOT GAS + STEAM CONNECTS FOR DOWN RUN
10" L.P. STEAM LINE
6" EVERLASTING VALVES
10" GATE VALVE
6" HOT GAS LINE
16" L.P. STEAM HEADER
6" GATE VALVE
ORIFICE PLATE IN VERTICAL PIPE
6" PLUG VALVE
6" H.P. REGULATOR
12" H.P. HOT GAS HEADER

FIG. 1.

Reformed Natural Gas at Chicago

● **H. J. WIEDENBECK, the Chicago By-Product Coke Co., Chicago, Ill.; addressing 1934 A. G. A. Joint Conference of Production and Chemical Committees, New York; topic "The Production of Reformed Natural Gas at the Chicago By-Product Coke Co."—(Abstract):**

THE introduction of natural gas to the city of Chicago and the subsequent 800 B.t.u. gas served to that community has brought forth the problem of manufacturing a variable quantity of a suitable gas for dilution. Due to the fact that a coke oven plant is part of the equipment, coal gas of 550 B.t.u. is used as the base diluent, and a reformed natural gas of 550 B.t.u. was found to be suitable for peak loads.

The reformed gas is made in three-shell water gas sets, which can also be used for emergency equipment during natural gas failure. It is a mixture of blue gas, partially cracked natural gas, and blast gas left in the set after the blow.

The water gas plant consists of nine three-shell Western Gas Construction Co. 11-feet, standard, hot valve sets, with automatic controls. Four of these sets are equipped to reform natural gas.

The natural gas to the machine is connected to the up and down steam lines, each line having a butterfly control valve. A gas reversing valve, operated by the hot valve, controls the up and down gas. The gas to the generator is controlled by twin hydraulic operated valves. The space between the twin valves is vented to the wash box and is equipped with a hydraulic operated valve. The generator blast valve hydraulic line is interlocked with the twin valves and can only open when the gas valves are closed. A hand operated valve is installed to close off the gas from the set. An orifice in the main line to each set indicates the volume of the gas by means of a mercury differential gauge. Each set is equipped with a gas pressure regulator which controls the pressure in the line up to the butterfly control valves. Fig. 1 shows this installation.

The reform gas is made in the water gas generators by passing natural gas, with steam, through the incandescent fuel bed on both the up and down runs. The operation is much the same as with carburetted water gas, except that natural gas is passed through the generator in place of introducing oil in the carburetter. The volume and B.t.u. of the resultant gas is dependent upon the temperature of the fuel bed, the time of contact of the natural gas in the generator and the quantity of steam used.

The primary object of our operation is to produce a maximum quantity of 550 B.t.u. gas, suitable from the utilization standpoint, without the presence of lampblack in the gas. Many different cycles were used and a method for determining the lampblack content of the gas was developed.

The steam rates were increased until the lampblack in the reformed gas was as low as one or two grains per 100 cu. ft. The percentage of up steam and gas, and down steam and gas was changed to give favorable clinker conditions. The machines were then run 48 hours before cleaning the fires.

In view of the fact that it is unnecessary to store heat in the carburetters and superheaters, a high blasting rate was used. The resultant low fuel consumption was favorable, but this was discontinued due to the low temperature and low carbon monoxide content of the blast gas which caused explosions when the blast gas was ignited.

The capacities of the reformed gas sets were increased 60 per cent by increasing the air purge, together with the steam and gas rates. This was found unfavorable due to the high lampblack content of the reformed gas, which was caused by the decreased time of contact of the steam and the incandescent lampblack in the generator.

Uniformity of the size of the fuel was found to be necessary to maintain a "balanced" generator. Our best results were obtained with egg size coke (over a 2¼-inch—through a 3½-inch screen).

A tar residue is condensed out of the gas but the amount has not been determined on account of the small quantity present. During the time reformed gas was made with a high lampblack

content, this tar, together with the lampblack, caused serious stoppages at the tubular condensers and deposited at valves, making them hard to operate. The mixture of the two is a very gummy substance that cannot be made fluid by heating. One representative sample was composed of one-third lampblack and two-thirds heavy viscous tar.

Equipment for removing the entrained carbon in the gas, immediately after the sets, appears essential. Although an operation cycle that will reduce the entrained carbon to one or two grains per 100 cubic feet can be found, it is practically impossible to control the correct balance in the generator at all times and the entrained carbon will have left the set before the incorrect balance is anticipated. The gummy mixture of tar and carbon then deposits at the most inconvenient places and trouble is encountered.

With suitable equipment for lampblack removal, the capacity of the sets could be increased and the density and composition of the gas can be varied to suit the conditions.

Naphthalene scrubbers are necessary equipment.

Tie In With the Better Housing Program

(Continued from Page 11)

"With this information we are now ready to invade our market in efforts to sell gas appliances financed by loans procured under the National Housing Act."

The plans described in the foregoing pages are the most comprehensive which have come to the notice of *Western Gas* thus far. We shall be glad to hear from other companies and cover their housing tie-in organization efforts in later issues.

Replies from numerous other companies speak in general vein of cooperation with local Housing Committees. Many companies are already bringing information on the Housing Act loans to their customers through advertising, and through the efforts of outside sales forces and dealer contact men.

In some areas local gas company cooperation with the Housing activity is awaiting conclusion of surveys being carried on by Housing Committees. For example, F. M. Rosenkrans, new business manager of The Gas Service Co., informs us that 200 government employees began work in Kansas City, Mo. in early October on a survey covering housing and property conditions, data from this complete survey to be made available to all business interests, forming the foundation for all types of improved housing promotion including that of The Gas Service Co.

A letter sent last month to district managers of the Western United Gas and Electric Co., Aurora, Ill., by C. H. Kallstedt, vice-president, points out that many appliance sales resulting from the housing drive will be handled through the company's own finance plan. The latter is nearly as liberal as the home loan provisions, which is true in many other companies. However, home modernization resulting from the general campaign should create a strong demand for appliances—on the theory that a new kitchen calls for a new range—and this supplies all the reason that is needed for full cooperation with all housing agencies.

Nothing has been said above of the work of appliance manufacturers, many of whom have been taking advantage of the housing loans in their sales activities for the past two months. A number of excellent advertisements suggested by manufacturers for utility or dealer use, and featuring appliance purchases through the new home improvement loans, have come to *Western Gas'* attention.

Operating Cost Fluctuation Recognized in Rates

THERE has been much interest in the recent rate agreement between the City of Cincinnati and the Union Gas & Electric Co. which provides for adjustments in rate schedules due to changes in costs occasioned by regulations imposed by the United States Government or other political subdivisions. Through the courtesy of C. G. Eichelberger, assistant to the president of the Cincinnati company, the following pertinent extract from the recent contract between the city and the utility is reproduced:

Section 6. "Regulations" as used in this section shall mean such regulations imposed on the Company by the General Assembly or officers of the State of Ohio or by the Congress or officers of the United States or by code or other authority under authorization of the State of Ohio or the United States, by reason of which the costs to the Company are affected with respect to coal, wages and hours of employment.

The rate schedules herein are based on the costs prevailing on the effective date of this ordinance which include costs by reason of taxes levied and regulations imposed by governmental authorities. Some such taxes and regulations now levied and imposed may be temporary, and other taxes may be levied and regulations imposed which may also be temporary. In case any such taxes now or hereafter levied, or any such regulations now or hereafter imposed may be repealed during the term of this ordinance, decreases in the within schedules shall be made as hereinafter provided. In case any such new and additional taxes may be levied, or any such new and additional regulations may be imposed during the term of this ordinance, increases in the within schedules shall be made as hereinafter provided.

Such decrease or increase in said schedules shall not be made unless any or all such taxes repealed or levied, and any or all such regulations repealed or imposed affect such costs to the extent of two hundred thousand dollars ($200,000.00) within twelve (12) months from date of repeal or imposition. Said sum of two hundred thousand dollars ($200,000.00) shall be the proportionate part allotted to the City of Cincinnati of the total amount so repealed, or so levied or imposed on the entire property used and useful of the Company, or on the entire business of the Company, within and without the City of Cincinnati.

National Safety Council Elects; Contest Awards for Utilities

ELECTIONS at the National Safety Council sessions held this year at Cleveland October 1-5 placed the following, among others, on the Public Utilities Section Executive Committee:

General Chairman—E. J. Kreh, Philadelphia Co., Pittsburgh, Pa.

Vice-Chairman for Gas Interests—John J. Barada, Laclede Gas Light Co., St. Louis, Mo.

Secretary—H. W. Lueck, Commonwealth Edison Co., Chicago, Ill.

Publicity Committee Chairman—Ray A. Edwards, San Diego Consolidated Gas and Electric Co., San Diego, Calif.

Statistics and Contest Committee Chairman—C. H. Dinsmore, Wisconsin Power & Light Co., Madison, Wis.

Results in the National Safety Council annual safety contest for public utilities, which ran from July 1, 1933 to June 30, 1934, have just been made known. Gas Division winners were the following:

Gas Division—Group A

1. Hope Natural Gas Co., Pittsburgh, Pa. 3,065,169 hours, 3 injuries.
2. Equitable Gas Co., Pittsburgh, Pa. 1,562,033 hours, 3 injuries.
3. Oklahoma Natural Gas Corp., Tulsa, Okla. 1,197,765 hours, 5 injuries.

Gas Division—Group B

1. Reserve Gas Co., Pittsburgh, Pa. 317,912 hours, no injuries.
2. Peoples Gas Co., Port Arthur, Texas. 144,753 hours, no injuries.
3. Atlanta Gas Light Co., Atlanta, Ga. 850,767 hours, one injury.

Burner Rental Plan at Lincoln

Consumers of the Iowa-Nebraska Light and Power Co., at Lincoln, Neb., and vicinity, are being offered gas conversion burners for house heating during the coming winter at a rental charge of 15 cents per day. Rental payments may be applied on purchase of the equipment.

Lone Star System Meeting

Lone Star Gas System will hold its annual conference for foremen and managers of all company units in Dallas on November 9. A. W. Breeland, safety supervisor for the System, has charge of program arrangements.

Kentucky Pipe Line Extended

Warfield Natural Gas Co. is extending its Kentucky natural gas pipe line from Beaver Creek to Troublesome Creek, a distance of 20 miles.

Los Angeles Vote Goes Against Gas Franchise Amendment

LOS ANGELES voters at a special election September 27, defeated the proposed amendment to the Los Angeles city charter which would have permitted the city to grant a 40-year gas franchise to the three companies serving in the city. The vote was very light, made up of about 25 per cent of those registered, and the final unofficial count was No—97,958; Yes—95,155. It is possible that an effort will be made to resubmit the amendment at the next city election, scheduled for April.

Two other amendments which were adopted at the September 27 election gave the Board of Water and Power Commissioners authority to borrow money to acquire the electric system of the Los Angeles Gas and Electric Corp., and to assume the bonded indebtedness of any business which it should desire to acquire.

For the past 67 years the Los Angeles Gas and Electric Corp. has operated under a constitutional franchise similar to those in force in other large cities in California. The Los Angeles County Superior Court has held that this franchise permits the distribution of gas for illuminating purposes only, and has ordered the company to secure a general gas franchise by July of next year. The course is open to the company of continuing litigation on the court's ruling.

Mitchell Takes Adams Post at Northern Indiana Public Service

Announcement has been made of the resignation of H. H. Adams, as vice-president and general manager of the Northern Indiana Public Service Co., Hammond, Ind., effective October 15. Mr. Adams has also resigned as assistant to the president of the Gary Heat, Light and Water Co., as vice-president and general manager of the Indiana Hydro-Electric Power Co., and from the directorate of the Indiana Public Service Co.

D. H. Mitchell, vice-president and controller of the company, has become senior vice-president and general manager, according to late October announcement of John N. Shanahan, chairman.

Geo. Rooker, vice-president of the Gary Heat Light & Water Co., has been placed in charge of operations at that plant, according to Mr. Shanahan.

Devlin Succeeds Seavey on California Commission

Frank R. Devlin, appointed to succeed Clyde L. Seavey on the California Railroad Commission, assumed his duties on October 9. The present appointment is for the unexpired term, ending in December, but Governor Frank F. Merriam has indicated that he will appoint Mr. Devlin for the full term of six years to follow. Mr. Devlin served a previous term as railroad commissioner in California, resigning in 1921 to reenter law practice in San Francisco. He was at one time a member of the California assembly.

New 3-Mile Line

Southern California Gas Co. is constructing 3 miles of 16-inch natural gas pipe line in the vicinity of Inglewood, Calif., to reinforce its transmission facilities.

Pipeliners are laying a mile of 8-inch Republic pipe a day on American-Michigan Pipe Line Co. job.

Muskegon to Have Natural Gas in November

THE middle of November will see natural gas turned into the service mains at Muskegon, through the 55-mile 8-inch welded line, now under construction from the Austin pool in Mecosta County, Mich.

American-Michigan Pipe Line Co., newly formed subsidiary of American Light & Traction Co. will operate the line, with the Muskegon Gas Co., affiliated with the same interests, distributing the gas in Muskegon. United Light and Power Engineering and Construction Co. has charge of laying the line.

Although the Muskegon line has long been discussed, it was not officially announced until August 28, after officials of the companies involved had been fully convinced by competent authorities of the reliability of the Michigan fields as a source of supply.

Since announcing the project the line has moved forward rapidly with close to a mile of pipe being laid each day since September 17 when actual construction was commenced.

Crossing the Little Muskegon River, two miles above Croton, has been one of the more difficult pieces of work in connection with the project. Two 6-inch lines, spaced about 400 feet apart, make up the crossing, with the pipe being buried 3 feet below the river bottom.

Rotten stumps have also been encountered along a part of the right-of-way. It has been necessary to pull these out with a tractor equipped with a winch, rather than dynamiting them out. Swampy land near Morley and a boggy condition of the soil near Stanwood also provided elements of difficulty.

Currently with the announcement of the project, work began in Muskegon in preparation for turning natural gas into the local system. Seventy change-over men were hired September 11 and following a training period were sent out to adjust every burner for natural gas. Current advertising pointed out that the first call made by the men was for the purpose of enlarging the flame outlet of the burner; and that a second call would be made after natural gas was turned on, in order to reduce the size of the opening through which the gas flows and to open air shutters on the mixers.

In promoting house heating installations the Muskegon company has made provision for delivering manufactured gas for central house heating at rates equivalent to natural gas when it is available. Househeating installations had averaged 15 per day for the campaign period as announced October 5. Employee aid was enlisted in building a prospect list for househeating, the program being presented to them at a company banquet.

An "Old Gas Range Contest" was held from September 4 to October 6. A new and modern gas range was given free to the customer turning in the oldest range on the purchase of a new. Extra allowances of $15 were awarded for 2nd and 3rd prizes; $10 for 4th, 5th and 6th prizes; and $5 for 7th to 11th prizes, inclusive. Entry blanks were securable either at the gas company sales offices or from dealers, upon the purchase of a new range.

A series of 14 free lectures in cookery and nutrition given at the Home Service Department of the gas company have also had their place in making the city natural gas minded. Demonstration teas were announced for women's clubs and church organizations, along with free planning service for menus for special occasions.

In addition to featuring the major types of gas burning appliances, newspaper advertising is strengthening the confidence of Muskegon citizens in the reliability of the gas supply.

A total of 520 pipeliners are engaged in constructing the line, with 150 extra men working in Greater Muskegon, making ready for the gas.

Minneapolis Co. Begins Construction

Minneapolis (Minn.) Gas Light Co. has begun construction of its natural gas pipe line from the Northern Natural Gas Co.'s terminus at the Minnesota River, into the city. Two 12-inch lines are being laid on the river bottom, below the river bed.

Eliminating Low Pressure Areas

Alabama Utilities Service Co., Montgomery, Ala., is planning a $7,000 project to eliminate the last of the low pressure areas in the Montgomery distribution system, according to Morris White, manager of the company.

16-Inch Line Construction Completed by Western United

WESTERN United Gas and Electric Co. of Aurora, Illinois, supplying gas to approximately 100 towns in the state, has completed the construction of 8 miles of 16-inch pipe, paralleling an existing line north of Joliet and tieing in with a 12-inch main constructed in 1933. Both the 1933 project and the present line were constructed for the purpose of increasing the capacity of the system serving gas to the suburban territory just west of Chicago.

Two views on 16-inch line construction of Western United Gas and Electric Co.

The line is constructed for 100 pounds pressure and is acetylene welded. Construction started July 20 and was completed September 29.

In one of the accompanying views is seen a new type of pipe jack, designed by J. H. Owens, superintendent of construction for the company. The jack is constructed with a detachable roller chain so that the pipe turns on roller bearings. The pipe support is adjustable both vertically and laterally in order that two lengths of pipe can be brought into proper position for welding. The jacks allow several welders to work at separate joints simultaneously, the pipe turning so that each can always be welding on top.

During the current year Western United has also constructed 2 miles of 12-inch pipe for delivering natural gas to the production station of the company just north of Joliet, and 2 miles of 8-inch pipe increasing the facility for serving gas to Wheaton, Ill. A mile of 8-inch pipe is now under construction to increase capacity into the holder station at La Grange.

Kerrville Gas Co. Up For Sale

November 3 has been set as the date for the court sale of the Kerrville (Texas) Gas Co. The city of Kerrville is proposing to issue up to $50,000 in revenue bonds for the acquisition of the plant and assets of the company at the time of the sale, according to city manager A. P. Hancock.

First Home Study Course on Natural Gas

A HOME study course on natural gas, the first of its kind, was announced last month by the American Gas Association, to be conducted by the University of Kansas Extension Division in cooperation with the A.G.A. Need for the course has been felt for some years, and its inauguration comes as a result of the Natural Gas Department's interest in the project.

Following the designation of the University of Kansas, the Natural Gas Department appointed an advisory committee to review all lesson material and advise with Prof. C. M. Young, head of the University's Mining Engineering Department, who agreed to prepare and conduct the course under the direction of the Extension Division. Members of the Advisory Committee are F. L. Chase, vice-president, Lone Star Gas Co., Dallas, Texas; J. D. Creveling, Henry L. Doherty & Co., New York, N. Y.; Dr. J. B. Garner, Hope Natural Gas Co., Pittsburgh, Pa.; and A. B. Macbeth, president, Southern California Gas Co., Los Angeles, Calif.

The course consists of 27 lessons, covering the contents of a two-volume text, "Natural Gas", written especially for the extension work.

Cost of the course to A.G.A. members, or employees of member companies, is $60.00, and $80.00 to others.

Although it does not provide credit towards any University degree the work is equivalent to that required in a 5- or 6-hour engineering course. The Extension Division of the University will issue a certificate to students upon successful completion of the course.

Following is the outline of lessons comprising the natural gas home study course:

OUTLINE OF LESSONS

1. Introduction.
2. Geography.
3. General Considerations.
4. Physics and Chemistry.
5. Section A. Pressure and Pressure Instruments. Section B. Absolute Pressure. Section C. Temperature and Absolute Temperature.
6. Laws of Gases.
7. Physical and Historical Geology.
8. Section A. Origin of Oil and Gas. Section B. Gas Reservoirs.
9. Prospecting.
10. Leases.
11. Standard Drilling Methods.
12. Section A. Rotary Drilling Methods. Section B. Casing and Cementing.
13. Completion of Wells.
14. Section A. Capacity of Wells. Section B. Estimation of Reserves.
15. Section A. Field Measurement. Section B. Installation of Orifice Meters.
16. Section A. Transportation. Section B. Compression.
17. Section A. Pipe Thickness and Strength. Section B. Corrosion.
18. Section A. Right-of-Way. Section B. Leakage.
19. Section A. Distribution. Section B. Materials and Joints for Mains.
20. Leakage.
21. Section A. Regulators or Governors. Section B. Proving, or Testing for Accuracy.
22. Section A. Utilization. Section B. Combustion.
23. Flame Temperature.
24. Section A. Burners. Section B. Adjustment of Burners.
25. Domestic Utilization.
26. Section A. Industrial Use. Section B. Re-Forming Natural Gas.
27. Liquefied Gases.

Further information relative to the course may be had either from the University Extension Division of the University of Kansas, Lawrence, Kan., or from Kurwin R. Boyes, Secretary of the American Gas Association, 420 Lexington Ave., New York, N. Y.

Barber Conversion Burners Receive A.G.A. Approval

Announcement is made by the Barber Gas Burner Co. of Cleveland, Ohio, that the company's conversion burners have been accorded full approval by American Gas Association Testing Laboratories, and are so listed in the October issue of "Approved Appliances."

Several improvements have been made in the Barber gas burner line, according to Harry Kerr, president of the company. The size range has been further amplified by the addition of three new units for round warm air furnaces, steam and hot water boilers, which now makes available a Barber assembly for any grate diameter from 12 inches to 34 inches inclusive.

Refinements have also been made in the design of the Barber jet and the entire assembly, to effect more quiet operation without reducing the high flame temperature of 1900° for standard gas consumption. Barber automatic gas burners are now equipped with the Spencer Klixon No. C-1888 safety pilot.

New illustrated descriptive literature covering the above improvements as well as revised price lists may be had upon application to the company.

Fluor Corp. Installing New Plants

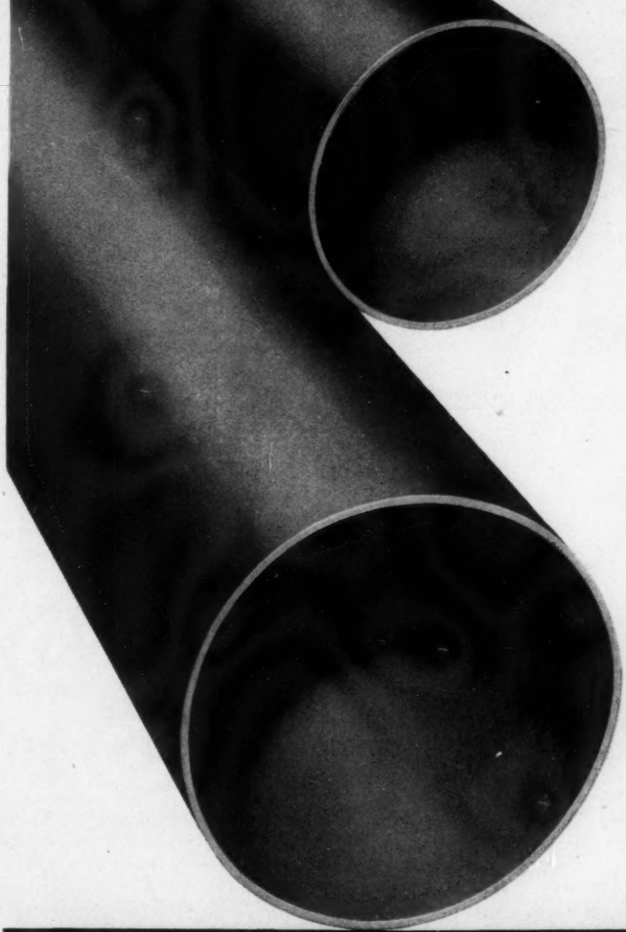
The Fluor Corp., Ltd., Los Angeles, is erecting a seven-unit compressor plant at Kettleman Hills, Calif., for the Kettleman North Dome Association, according to J. S. Fluor, Jr. The company is also constructing a refinery unit for the Standard Oil Co. at Richmond, Calif., and a propane dewaxing plant for the Shell Oil Co., at this time.

1933 Natural Gas Statistics Ready

The Bureau of Mines was scheduled to bring from the press late in October its "Mineral Market Report on Natural Gas," covering final 1933 statistics on natural gas production, consumption, etc., according to G. R. Hopkins, acting chief economist, Petroleum Economics Division of the Bureau.

ALL THESE ADVANTAGES ARE COMBINED ONLY IN STEEL GAS MAINS

and together they mean



RELIABILITY *to the highest degree*

No one quality or advantage but rather a combination of several must be incorporated in pipe for gas mains, if it is to meet the exacting demands of modern service. NATIONAL Steel Pipe has the qualities important for such use. Easy installation, low maintenance cost, long service, maximum safety, are provided when NATIONAL is specified.

High tensile strength and extraordinary ductility make NATIONAL steel mains reliable under vibration and shocks of traffic, cave-ins, trench pressures and settling of filled ground. Superior quality, adaptability to all types of joint, and fewer joints per mile speed up laying operations and on completion reduce interruptions of service to a minimum. All gas line pipe is tested and inspected to the rigid requirements of the A.P.I. specifications. Thus, true economy and satisfaction are obtained to the highest degree. For severe corrosive soil conditions, various coatings and linings are available. Questions concerning steel gas mains will be gladly answered by the engineering and technical departments of the largest manufacturer of tubular products in the world.

NATIONAL TUBE COMPANY, Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

NATIONAL STEEL GAS MAINS

MODERN METHODS AND MATERIALS

A letter to WESTERN GAS will bring you any of the selected reference bulletins listed below, without cost. Indicate by number which you desire.

NO. 32—WELDING PRESSURE VESSELS

Bulletin on automatic shielded electric arc welding and fabrication of welded pressure vessels. Information on welding tests. 20 pages illustrated.

NO. 33—INSTALLING REFRACTORIES

General catalog on line of fire brick and other refractory products, with field illustrations for their installation. 32 pages. 53 illustrations.

NO. 34—COMBUSTION EQUIPMENT

Several related bulletins covering proportioning valves for gas-air and oil-air; gas burners, blowers, safety shut-off valves, and other equipment for industrial fuel burning. High pressure gas burners, motorized power gas valves, single and multi-stage turbo blowers.

NO. 35—FITTINGS CATALOG

Pocket size catalog on pipe fittings—cast iron, malleable and electric cast steel. Standard sizes and dimensions given with price information. 224 pages, illustrated, fabricoid cover.

NO. 36—GAS RANGE QUESTIONNAIRE

Sales and service data on line of gas ranges, presented in question and answer form, with illustrations. 9 separate sections, approximately 400 questions answered.

NO. 37—GAS STEAM ENGINEERING DATA

Practical rules for reference in estimating steam radiation and calculating heat losses. Heat loss tables and residence plans to illustrate examples of figuring radiation required.

NO. 38—INDUSTRIAL BURNER CATALOG

Conversion burners for domestic use; special design burners for a wide variety of industrial applications. Fully illustrated.

NO. 39—OXYGEN-ACETYLENE REGULATORS

Bulletin presenting line of pressure regulators for oxyacetylene welding and cutting, with discussion of regulation problems. Illustrative curves and diagrams; 16 pages.

NO. 40—COPPER PIPING

Pamphlet covering use of copper piping for varied uses, particularly underground service and interior plumbing. Tables of working pressures, weights, wall thickness, and other specifications. 20 pages, illustrated.

NO. 41—PORTABLE COMPRESSOR

Bulletin describing new two-stage air-cooled portable compressor, in oil engine and gasoline engine driven units.

Astogril Broiler.

Simmer-Save Burner.

New Features for 1935 Wedgewood Models

JAMES GRAHAM MFG. CO., San Francisco, Calif., has incorporated two new features in its 1935 models of the Wedgewood gas ranges, now on production. The accompanying photographs show the Astogril Broiler and the Simmer-Save Burner, patented features licensed for use by a limited number of range manufacturers, the James Graham Mfg. Co. being exclusive licensee to use them on the Pacific Coast, according to the company.

The Astrogril Broiler is an aluminum disc which may be preheated so as to immediately sear the under side of any food placed on the grill for broiling, keeping juices and flavor intact instead of allowing them to escape into the pan. The holes in the broiler allow the grease to run into the pan below, thus preventing it from catching on fire.

The Simmer-Save Burner has two burner necks which operate separately on a two-way valve. When the valve is first turned to the half-way position it opens the valve feeding the burner arm which supplies the simmer portion of the burner. This is the center portion, which has 6 ports. Turning the valve completely around opens up the second neck of the burner which feeds the outer rim, thus supplying gas simultaneously to both simmer burner and outer rim burner. After the food comes to a boil the valve may be turned back half-way, cutting off the gas to the outer rim and maintaining supply to the simmer burner. The simmer burner will maintain a pot of water holding 8 quarts at boiling temperature. At full open the simmer burner uses about 25 per cent of the full burner capacity, effecting a positive means for gas saving.

New Multi-Flame Linde-Welding Head Developed

The Linde Air Products Co., New York City, has developed a multi-flame Lindewelding head, consisting of a chromium-plated stem and tip for use with standard blowpipes. The tip design provides three flames: a welding flame in the usual position, and two smaller auxiliary flames so positioned as to preheat both edges of the vee ahead of the advancing puddle. The chief modification in technique brought about by the multi-flame head is a lengthening of the stroke to insure even preheating of the vee by the auxiliary flames and an even and more rapid compensatory melting of the special Lindewelding rod.

Minnesota Valley Natural Gas Co. Begins Service

Minnesota Valley Natural Gas Co. began service of natural gas in St. Peter, Minn., late in September. Construction of the company's distribution systems in the towns of Le Seur, New Prague, Montgomery, and Le Center, Minn., is being rapidly pushed to completion so that natural gas service may begin before the end of the year. Supply is coming from the Northern Natural Gas Co.'s recently completed 50-mile, 6-inch line.

Natural Gas Change-Over Completed in Indiana Towns

Indiana-Ohio Public Service Co. is substituting natural gas service for manufactured gas in the towns of Portland, Winchester and Union City, Indiana. Portland received natural gas October 1 and the other two towns were to receive it during the month. Natural gas for the system is secured from wells three miles out of Portland. C. E. Lakin is president of the company.

Empire Companies Appoint Wilson General Auditor

M. A. Wilson was recently made general auditor for The Empire Companies, Doherty subsidiary, headquartering at Bartlesville, Okla., succeeding O. P. Warlick, deceased. Mr. Wilson has been with the Doherty interests since 1913, rising in rank until he was made assistant general auditor in 1921.

New Terrell, Texas Offices

The Terrell, Texas, office of Community Natural Gas Co., in the near future will be located in a recently purchased brick building which the company is planning to remodel, according to B. B. Strongfellow, district manager.

On the news

Welsbach Company Views Future With Optimism

With E[illegible]loit Products in [illegible] and cerium, drying [illegible]nd igniting to burn the thread [illegible]nd convert the nitrates into Ex[illegible]les [illegible]ai[illegible]

VISION PROSPERITY HERE IF PLANS WIN

Name of Firm Internation-

Established [illegible]887, the oldest f[illegible] the [illegible] the Welsbach C[illegible]pp[illegible]as [illegible]ried on. Its h[illegible]or[illegible]a[illegible]een [illegible]esplendent with [illegible]nts, many of which have brought it and its individual

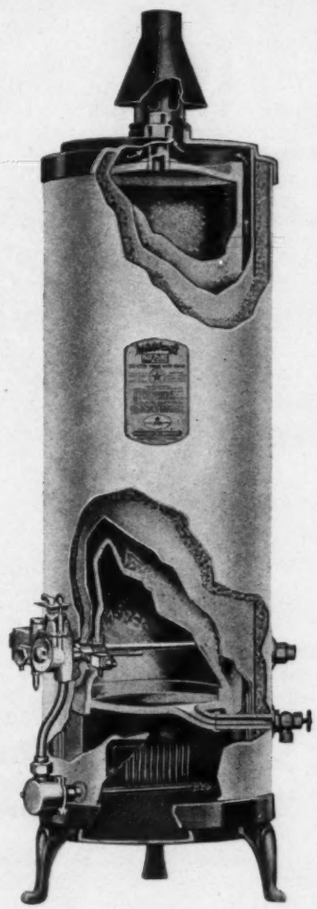
Welsbach, borne witne death, sorr ness, myster the pious a It has lent

MODERN GAS BURNING EQUIPMENT BY Welsbach

Welsbach, famous Reflex gas mantles (shown above). Millions have been sold. This first forward step in gas lighting was developed and manufactured in Welsbach Laboratories.

SEE THE NEW WELSBACH HOTZONE BROILER GRIDDLE

—with the patented HotZone Broiler Burner (shown below) . . . its INFRA RED RAYS give unsurpassed results. Cooks uniformly. Broils faster. Enriches foods. For restaurants, hotels, clubs.

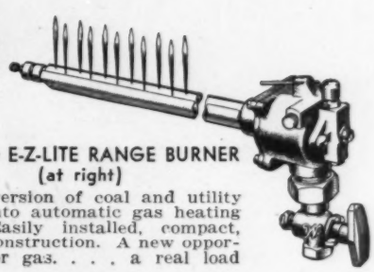


WELSBACH HOTZONE SELF ACTING STORAGE GAS WATER HEATER (at left)

Exceptionally well built. A size, model and type for every individual need. Highly developed safety devices furnished. Market for this type equipment only 10% saturated.

WELSBACH SPACE HEATER No. 70

With E-Z-LITE BURNER and safety gas shut off (at left). Primarily for kitchen heating, adaptable to any "cold spot." Sturdy, attractive, efficient.



The New E-Z-LITE RANGE BURNER (at right)

For conversion of coal and utility ranges into automatic gas heating units. Easily installed, compact, lasting construction. A new opportunity for gas. . . . a real load builder.

ALL ON EXHIBITION. WELSBACH BOOTH. CONVENTION HALL, ATLANTIC CITY, OCTOBER 29th TO NOVEMBER 2nd.

Welsbach

Since 1887, pioneers in the manufacture of Gas Burning Appliances

The Welsbach Company, Gloucester City, N.J.

Branches in Principal Cities

Cathodic Protection of Pipe Lines

(Continued from Page 15)

value of cathodic protection under various conditions.

The operator of pipe lines may be confronted with one of the problems outlined below, and we wish to know if drainage affords a money-saving solution.

1. A pipe line several years old has reached a point, through coating deterioration, where in order to save the pipe and prevent excessive leakage a general reconditioning will be required.

Question: Recondition, or drain?

2. A line has been completed through bad soils; coating is good, resistance high.

Question:

(a) Should drainage be applied?

(b) Drain immediately, or defer until there is evidence of corrosion due to coating failure?

(c) Drain entire line or sections in corrosive soils only?

TABLE NO. 3

Year	Reconditioning	Replacement	Totals
1925 (6 mo.)	.....	.....	.....
1926	.....	.....	.....
1927	.....	.....	.....
1928	$ 745	.....	$ 745
1929	4,135	$ 6,497	10,632
1930	12,457	9,159	21,616
1931	18,214	.....	18,214
1932	13,388	.....	13,388
1933	7,689	.....	7,689
Totals	$56 628	$15,656	$72,284
Total length (feet)	45,099	5,126	50,225

Obviously, answers to these problems cannot be given which would be universally correct; rather, each case must be analyzed separately and the decision predicated on all information available. It may be of interest, however, to equate annual costs of the two methods of corrosion mitigation for certain actual transmission lines which have been studied, and to sections of which drainage has been applied. These will illustrate the general problem mentioned above.

Case I—Ventura-Los Angeles Line: This is a 12¾-inch pipe line, 29 pounds per foot, total length 78 miles, completed July, 1925. First 47 miles traverse soils which are mildly or actively corrosive; remainder, except for short stretches, lies in decomposed granite and sand, which our experience shows is non-corrosive. Original coating — asphalt primer and two coats of hot asphalt. Expenditures for reconditioning and replacement (net cost) due solely to corrosion, for the 47-mile section are given in Table No. 3.

Recent measurements indicate that the original coating now has an average resistance of approximately 300 ohms per sq. ft., after 9 years in the ground. If it is assumed that all coating and pipe renewal costs would have been obviated by adequate drainage, and that coating resistance has been 300 ohms since 1925, then comparative overall expenditures may be derived as tabulated below.

Drainage costs have been calculated (see Table No. 4) for several alternative programs, as follows:

A. Entire 47 miles drained—1925-1933—annual cost $5,854.

B. 30.4 miles, comprising aggregate length of pipe in soils of low resistivity and where corrosion has been observed, drained—1925-1933 — annual cost $3,780. (Actual pipe reconditioned and replaced totals only 9.5 miles.)

C. Same as B except installation made in 1929 when serious corrosion first became evident—annual cost $3,780.

Provided the fundamental premise is sound; namely, that drainage would have eliminated pipe and coating renewals, very substantial savings could have been effected during the 8½-year period, ranging from $20,000 for complete drainage to $61,000 for program "C". Program "C" is apparently the most economical; hence it might be concluded that drainage of a new line should be deferred until corrosion develops. I think that this plan will usually result in the lowest overall costs; however, it involves the risk that corrosion may occur undetected, with consequent damage to the coating, thus lowering its resistance and increasing the cost of subsequent drainage. (See Fig. 2.)

I believe that Program "B" represents the safest plan consistent with reasonable economy. As applied to the general case of a new line, this would involve a predetermination of corrosive areas, using soil resistivity tests and a potential survey of the line to locate them. A few drainage stations would be established in the sections where trouble is expected, and initially, because of relatively high coating resistance, each station would drain 10 miles or more of line. As coating resistance declines, due to water absorption and possibly deterioration, additional stations would be installed as required to maintain the minimum negative potential deemed necessary for protection. Unless per-mile drainage costs will be very low, because of *sustained* high resistance, or reconditioning costs will be excessive due to paving, etc., drainage of the entire line should be adopted only if the operator is unwilling to rely upon available methods of identifying corrosive soils.

Case II — Huntington Beach-San Diego Line: This line is 12¾-inch, 34 pounds per foot. Total length 79.9 miles; 11.9 miles installed February, 1930, and coated with asphalt primer, cut-back asphalt, cotton wrapper, and asphalt; the remaining 68 miles completed September, 1932, and protected as follows:

Coating	Miles
Bare	9.2
Galvanized	3.0
Enameled (vitreous)	0.3
Asphalt primer, hot asphalt, rag felt, hot asphalt, rag felt, hot asphalt	16.0
Grease, asbestos felt, hot asphalt	1.7
Coal-tar primer, two coats coal-tar enamel, asbestos felt	37.8

The galvanized pipe weighed 81 pounds per foot and was used in river and marsh crossings.

Except for the sections where bare pipe was employed, the soils are quite corrosive, although the moisture content is low. After 4½ years, the average resistance of the 11.9-mile, asphalt-cotton coated section dropped to about 370 ohms per sq. ft.; whereas that of the coal-tar-asbestos coating after 2 years is about 16,000 ohms.

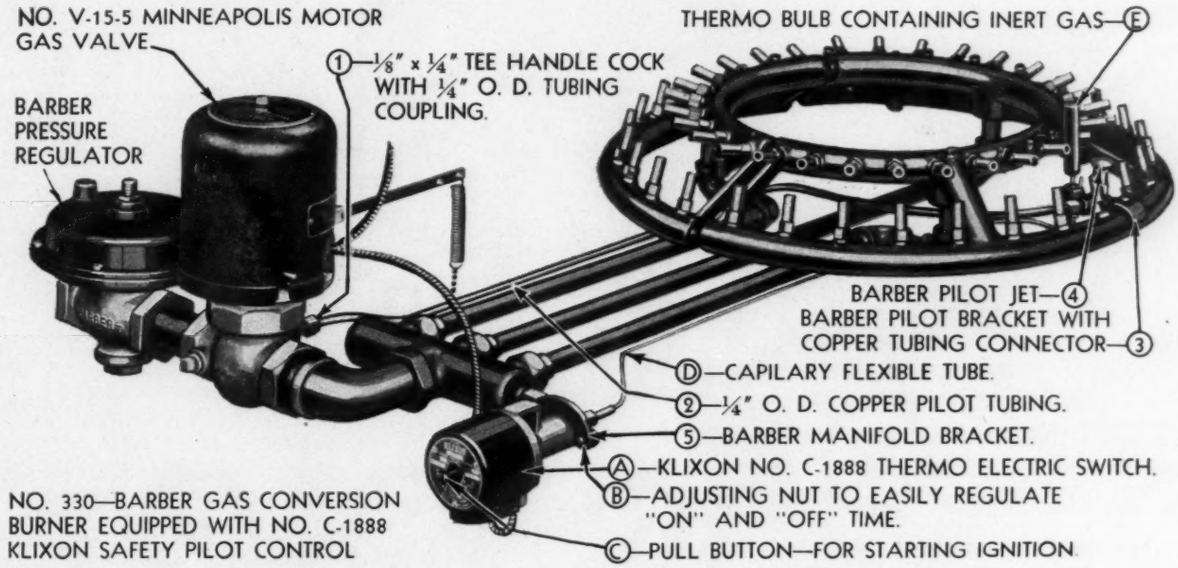
In 1933, inspection of the asphalt-cotton coated section showed that deterioration of the coating had proceeded so far that the pipe was deeply pitted except for 0.7 miles in dry sand, where corrosion was negligible. We concluded that complete reconditioning would be necessary within a 2-year period (except for sandy sections) unless cathodic drainage would arrest the pitting. After studying estimated costs of the two methods, drainage was adopted, and to date has successfully prevented further corrosion, as evidenced by examination of control specimens. As most of this section is located on a paved highway, unit repair costs would have been heavy. A comparison of actual drainage costs with estimated cost of coating renewal, is given in Table No. 5.

TABLE NO. 4. COMPARISON OF ACTUAL RECONDITIONING AND RENEWAL COST WITH ESTIMATED COST OF CATHODIC PROTECTION

	RECONDITIONING AND REPLACEMENT		CATHODIC PROTECTION					
			PROGRAM "A"		PROGRAM "B"		PROGRAM "C"	
Year	Expenditure	Interest for remaining Years @ 6%	Annual Cost	Interest*	Annual Cost	Interest*	Annual Cost	Interest*
6 Mo.								
1925	.....	.....	$ 2,927	$ 1,081	$1,990	$ 700	.....	.....
1926	.....	.....	5,854	1,833	3,780	1,187	.....	.....
1927	.....	.....	5,854	1,524	3,780	987	.....	.....
1928	$ 745	$ 252	5,854	1,231	3,780	797	.....	.....
1929	10,632	2,791	5,854	956	3,780	619	$ 3,780	619
1930	21,616	4,129	5,854	695	3,780	450	3,780	450
1931	18,214	2,251	5,854	450	3,780	291	3,780	291
1932	13,388	803	5,854	218	3,780	141	3,780	141
1933	7,689	.....	5,854	.....	3,780	.....	3,780	.....
TOTALS	$72,284	$10,226	$49,759	$7,988	$32,130	$5,172	$18,900	$1,501
	$82,510		$57,747		$37,300		$20.401	

*Interest computed on operating expenses only.

Study These Basic Improvements in BARBER BURNERS

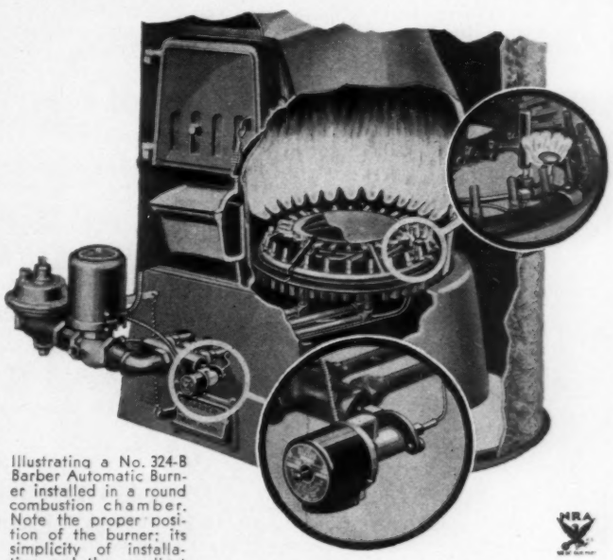

NO. V-15-5 MINNEAPOLIS MOTOR GAS VALVE
BARBER PRESSURE REGULATOR
1—⅛" x ¼" TEE HANDLE COCK WITH ¼" O. D. TUBING COUPLING.
THERMO BULB CONTAINING INERT GAS—E
BARBER PILOT JET—4
BARBER PILOT BRACKET WITH COPPER TUBING CONNECTOR—3
D—CAPILARY FLEXIBLE TUBE.
2—¼" O. D. COPPER PILOT TUBING.
5—BARBER MANIFOLD BRACKET.
A—KLIXON NO. C-1888 THERMO ELECTRIC SWITCH.
B—ADJUSTING NUT TO EASILY REGULATE "ON" AND "OFF" TIME.
C—PULL BUTTON—FOR STARTING IGNITION.
NO. 330—BARBER GAS CONVERSION BURNER EQUIPPED WITH NO. C-1888 KLIXON SAFETY PILOT CONTROL

(UPPER AND LOWER BAFFLES NOT SHOWN ABOVE)

THE Barber Burner illustrated above acquaints you with the many betterments recently incorporated in this already dominant Automatic Gas Burner—the first Conversion Burner on the market to receive the official Approval of A.G.A. Testing Laboratory. To the recognized, accepted features of Barber efficiency, such as the improved Barber Jet, the Barber Pressure Regulator, and the adaptability of Barber tailor-made assemblies to suit and fit furnaces or boilers, other Barber improvements have now been added.

Three *new* round sizes are now available, furnishing accurately fitted assemblies for all grate diameters from 12" to 34" inclusive. Further refinements have been made in the jets which effect quieter operation without reducing flame temperature. For thoroughly reliable control, Spencer Klixon No. C-1888 Safety Pilot is now used.

These progressive features stand as further evidence that Barber maintains its leadership in the Conversion Burner field. Remember that Barber supplies especially designed units for warm air heating in connection with air conditioning. Be sure to write today for New Illustrated Descriptive Bulletin and Revised Prices covering the above improvements.



Illustrating a No. 324-B Barber Automatic Burner installed in a round combustion chamber. Note the proper position of the burner; its simplicity of installation and the excellent heat-producing scrubbing action of the flame.

BARBER GAS BURNER COMPANY

3704 Superior Ave. Cleveland, Ohio

BARBER *Automatic Jet Gas* BURNERS

• *For Warm Air Furnaces, Steam and Hot Water Boilers* •

TABLE NO. 5.

RENEWAL AND/OR REPLACEMENT

Location	Length	Disposition	Unit Cost $ per Mi.	Total Cost
Line under highway pavement (heavy concrete)	1.8 mi.	Reconditioning cost exceeds replacement, abandon and replace after 5 years (a)	13,200	23,760
Line under highway shoulder	9.4 mi.	Renew coating within 2 years 50% each year	5,900	55,460
Line on private right of way	0.7 mi.	Sandy soil — indefinite life without repairs		
TOTALS	11.9 mi.			$79,220

CATHODIC PROTECTION

Length of line drained—11.9 mi. No. of drainage stations—5.
Potential across coating at section extrem. (min.)—0.2 volts.
Length of sections—1.9—2.6 mi. Current per station—35 amperes.

	Investment	ANNUAL COSTS Fixed Charges (b)	Operating Expenses	Total
Cost				
Rectifiers	$2,223			
Ground electrodes	1,468			
Total	$3,691	$598		$598
Operation and maintenance of drainage stations			$300	300 (c)
Energy required (total)—19,092 KWH per yr. Average cost per KWH.—1.68c. Total cost of energy			321	321
Total Costs				$1,219

(a) Corrosion allowed to proceed until perforations due to pitting render continued operation prohibitive.
(b) 10-year life assumed for drainage station equipment; Interest 7%; Depreciation 7.6%; Taxes 1.6%; Total Fixed Charges 16.2%.
(c) Of this figure only $150 per year represents increment expenditure, remaining $150 is allocation of patrolmen's time and auto mileage.

COMPARATIVE ANNUAL COSTS

YEAR	RECONDITIONING AND REPLACEMENT* Reconditioning	Replacement	Annual Cost	Interest for Remaining Yrs. at 6%	CATHODIC PROTECTION Annual Cost	*Interest for Remaining Yrs. at 6%
1934	$27,730	.....	$27,730	$19,120	$1,219	$428
1935	27,730	.....	27,730	16,469	1,219	369
1936	.....	.....	.....	.....	1,219	313
1937	.....	.....	.....	.....	1,219	260
1938	.....	23,760	23,760	8,038	1,219	210
1939	.....	.....	.....	.....	1,219	163
1940	.....	.....	.....	.....	1,219	119
1941	.....	.....	.....	.....	1,219	77
1942	.....	.....	.....	.....	1,219	37
1943	.....	.....	.....	.....	1,219	....
TOTALS	$55,460	$23,760	$79,220	$43,627	$12,190	$1,976
Ten-year cost including interest—Reconditioning and Replacement						$122,847
Ten-year cost including interest—Cathodic Protection						14,166
SAVING						$108,681

*Interest computed on operating expenses only.

Costs of cathodic protection in the above statement are based on the assumption that coating resistance will not decline further during the next 9 years. No change has been noted in resistance since drainage was started in January, 1934. Note that the estimated saving for 10 years is more than sufficient to completely recondition the line at the end of that period.

Recently we have been experimenting with intermittent application of negative potential to pipe lines. This investigation has to date been confined to laboratory tests, and was based on observation that an appreciable time elapses after opening the drainage circuit before the pipe returns to its original potential. For instance, tests showed that when 0.6 volts (net) is applied to a bare steel coupon for 1 minute, 2 minutes after the current is cut off there is a residual negative potential of 0.05 volts. This is presumably a depolarization effect, which should provide a means of conserving energy in drainage projects. Laboratory soil corrosion tests extending over 52 days, with 1-minute "on" and 2-minute "off" cycle showed the same weight loss for the intermittently and continuously drained specimens, and which was only 7 per cent of the weight loss of the undrained coupon. Under laboratory conditions, at least, intermittent drainage affords protection, and field tests are now under way to check this conclusion. If the experimental cycle can be successfully applied to pipe lines, energy requirements for a given drainage project will be reduced by 67 per cent, and annual energy cost by roughly one-half (dependent on power schedule applicable).

Conclusion

A brief summary of the present status of cathodic protection follows:

1. It has been demonstrated beyond question that a negative potential of 0.2 volts (net) pipe to soil will effectively prevent corrosion. There is also some evidence which indicates that negative voltage of *any* magnitude will suffice.

2. Laboratory tests show that negative potentials exceeding 1 volt cause loss of bond between pipe metal and thin bituminous coatings, when adjacent metal is bare. Actual drainage experience indicates that this action, if present at all under field conditions, does not impair coating resistance; furthermore, drainage projects can be economically designed for a wide range of conditions without exceeding 1 volt across the coating.

3. Unit electrical resistance of bituminous coatings in general use varies widely with age and porosity, and this variable is by far the most important factor influencing the cost of cathodic protection. Thus resistance of such coatings several years after installation on one gas system range from 134 to 16,000 ohms per sq. ft., and corresponding annual costs of drainage are $250 per mile and $7 per mile respectively.

4. Ultimate economic success of cathodic protection projects frequently depends on preventing *continued* deterioration of coating after drainage is applied. Experience to date indicates that for coatings several years old when drainage is started and which have therefore reached equilibrium in water absorption, deterioration is arrested by drainage. This opinion is based on observation of coating resistance. The information on this important point is quite meager as yet, and therefore inconclusive.

5. Provided the tentative conclusion No. 4 above is correct, cathodic protection of lines traversing corrosive soils will often effect very handsome savings over the alternative program of coating repair and renewal.

During the past 12 months

2 MILLION MCF

were added to the annual national load by the sale of

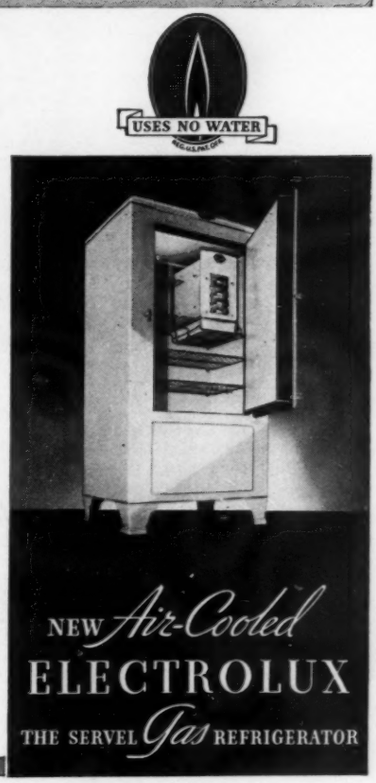
ELECTROLUX!

Did you get your share of this valuable increase?

Thanks to splendid cooperation of the gas industry, the past year has seen thousands more Gas Refrigerators installed on the lines throughout the country. This has meant an important permanent addition to the national load—greater, in fact, than the combined yearly consumption of 4 cities the size of Savannah. Yet this load increase—valuable as it is of itself—is but part of the real importance of gas refrigeration to the gas industry and to every individual company.

For, today, in the trying and uncertain times through which we are passing, one thing of vital consequence to every utility in the country is the *good will* of its customers. To maintain and augment this, means keeping the public sold on the service which it receives. The opportunities which gas refrigeration affords to publicize the greater usefulness and dependability of gas . . . to publicize, too, the modernity of gas as fuel . . . have been appreciated by officials of the great majority of the leading gas properties.

To these companies—as well as to all other companies—the manufacturers of Electrolux offer fullest cooperation in the active promotion of gas refrigeration in their territories. For merchandising and sales help, get in touch at once with Electrolux Refrigerator Sales, Inc., Evansville, Ind.



44

BUTANE-PROPANE NEWS

Tests at San Diego and Faribault Show Butane-Propane Desirable as Natural Gas Stand-by

By J. A. HARRITT

Superintendent Gas Production
*San Diego Consolidated Gas and Electric Company**

LITTLE progress has been made along the lines of manufacturing a substitute for natural gas since our report of September, 1933.†

The various methods developed up to that time appear to have been accepted as indicative of what can be done in the various oil and water gas manufacturing plants.

J. A. Harritt

Former coal gas plants present a much more complex problem and so far as we can learn, but little serious consideration has been given the subject as yet, in coal gas areas.

Some experimental work was done in San Diego, Calif., in March, 1934, and in Faribault, Minn., in May, 1934, which may be of help to our smaller utilities and of interest to all. This work contemplates the use of butane or propane or mixtures of the two, with air, as a substitute for natural gas.

The San Diego work covered some two weeks of experimenting with a mixture of equal parts of butane and propane mixed with air to various B.t.u. values and burned, both straight and with various proportions of natural gas, in the following test appliances, all of which were adjusted for natural gas at 7 in. water column:

1. Hoyt Instantaneous Water Heater,
2. A. B. Range,
3. Clow Gas-Steam Radiator,
4. Rado Gas Radiator,
5. Ward Floor Heater,
6. Humphrey 10-Radiant Heater,
7. Clark Jewel Range,
8. Fraser Hot Air Furnace,
9. Ruud Instantaneous Heater,
10. Junkers Calorimeter.

All appliances were connected by manifold with both natural gas and the various mixtures so that a comparison of operation was readily obtained and could be easily checked.

Vapor and air were mixed in varying proportions in 100-cu. ft. batches and tested straight and with 25, 50 and 75 per cent of natural gas in order to determine the most suitable substitute.

Mixtures below 1100 B.t.u. were too lean for good combustion and satisfactory appearance. The 1100 B.t.u. mixture was fairly satisfactory except on the Humphrey Radiant Heater, while the 1150 B.t.u. burned entirely satisfactorily on all appliances, surpassing as a rule the natural gas for which they were adjusted, in that the flames were firm and strong with more distinct cones than the natural gas and but little, if any, shorter.

A mixture of 1170 B.t.u. proved equally satisfactory and was adjudged as probably the best substitute for all conditions which might be met with in the distribution system. Mixtures above 1100 B.t.u. were perfectly satisfactory when mixed with natural gas, but a slight leanness of the 1100 B.t.u. was in evidence when more than 50 per cent was added to the natural gas.

A mixture of 1243 B.t.u. and 1.32 specific gravity was tested on a star burner of the Clark Jewel Range against natural gas of 1065 B.t.u. and 0.684 specific gravity.

Two tests were made on each gas, in heating 3 lbs. of water from 80°F. to 200°F., room temperature 78°F. and all conditions being maintained the same. Table No. 1 shows the comparisons.

It will be seen that the rate of flow of the butane-air through the orifice exceeds the calculated rate by approximately 12 per cent. This failure of the heavy gas to obey the accepted formula for flow through an orifice was evident throughout the tests.

At the close of the efficiency test this 1243 B.t.u. gas was turned into the test appliances and proved too rich, burning with a lazy flame and yellow tips on practically all burners except the Clark Jewel Range and Ruud Water Heater.

Junkers tests of the vapor used in the San Diego experiments gave a heat value of 2691 B.t.u., the vapor being drawn from the top of storage tanks.

It was evident that the B.t.u. and specific gravity within reasonable limits were a secondary factor in satisfactory combustion. The air content of the mixture was the governing factor. Thus a satisfactory substitute using propane would be of considerably lower B.t.u. and gravity than if butane were used. From these tests the air content appeared to be limited to a range between 55 and 58 per cent.

†Published in *Western Gas* for September, 1933, Pages 58-67.

*A report of the Pacific Coast Gas Association Production Committee, submitted at the 1934 convention at Del Monte, October 9-12.

TABLE NO. 1.

	Butane-Air	Natural Gas	Ratio = Comparison 100 × (Butane-Air) / Natural Gas
Pressure	7 in.	7 in.	
B.t.u.	1243.	1065.	116.60%
Sp. Gr.	1.320	0.684	193.00%
Time required	9'55"	9'22.5"	105.78%
Cu. ft. gas used	0.7285	0.8555	85.15%
Cu. ft. gas per hr.	4.4078	5.4756	80.50%
Efficiency %	39.755	39.745	100.025%

TABLE NO. 2.

	Propane-Air	Natural Gas	Ratio = Comparison 100 × (Butane-Air) / Natural Gas
Pressure	5.1 in.	5.1 in.	
B.t.u.	1150	990	116.20%
Sp. gr.	1.235	0.71	174.00%
Time required	9' 25"	8' 32"	108.40%
Cu. ft. gas used	1.29	1.51	85.43%
Cu. ft. gas per hr.	8.22	10.62	77.40%
Efficiency %	24.3	24.1	100.83%

While all of the various test mixtures were not tested over a wide pressure range, some were tested from 4 in. to 10 in. water column against natural gas of equal pressure. From visual observation these tests were entirely satisfactory.

From this work the conclusion is drawn that a satisfactory substitute for natural gas can be made by the cold carburetting of air with butane, propane or combinations of the two, to a heat value of approximately 1170 B.t.u. and specific gravity of approximately 1.30. These values would change somewhat in accordance with the quality of vapor used and the quality of the natural gas normally served.

At Faribault, Minn., where natural gas has supplanted the former coal gas, the Northern States Power Co. was faced with the problem of a reliable stand-by. In May, 1934, this company conducted a series of tests using pure propane and air mixtures both straight and mixed with natural gas. The natural gas at Faribault is of 990 B.t.u. and 0.71 specific gravity. Appliances used in this test consisted of:

1. Round Oak Range,
2. Rutz Pilot,
3. Magic Chef Range,
4. Hoffman No. 40 Tank Water Heater,
5. Welsbach 7 Mantle Space Heater,
6. Janitrol X1 Conversion Burner.

These were adjusted for natural gas at 5.1 in. water column. Propane-air gas of the following values was tested:

800 B.t.u.	1.164 Sp. Gr.
900 B.t.u.	1.185 Sp. Gr.
1000 B.t.u.	1.205 Sp. Gr.
1050 B.t.u.	1.215 Sp. Gr.
1100 B.t.u.	1.225 Sp. Gr.
1150 B.t.u.	1.235 Sp. Gr.
1200 B.t.u.	1.246 Sp. Gr.
1250 B.t.u.	1.256 Sp. Gr.
1300 B.t.u.	1.266 Sp. Gr.

The mixture of 1100 B.t.u. when compared with 990 B.t.u. natural gas of equal pressure ranged from "passable" to entirely satisfactory on the various appliances.

That of 1150 B.t.u. was entirely satisfactory on all appliances, as was also that of 1200 B.t.u.

Slight odors and yellow tips appeared at 1250 B.t.u., but the general characteristics of combustion were not unsatisfactory. Odors and yellow tips were more pronounced with the 1300 B.t.u. mixture, showing this to be too rich for satisfactory use.

Mixed with natural gas in the proportions 25-, 50- and 75 per cent the 1150 B.t.u. mixture gave entire satisfaction.

The 1000 B.t.u. mixture similarly mixed with natural gas proved too lean or of too high an air content.

The conclusion reached at Faribault was that propane-air gas from 1100 to 1250 B.t.u. could be used as a substitute for their natural gas, 1150 B.t.u. being adjudged the most satisfactory for all conditions.

A comparison of efficiency tests in heating 3 lbs. of water from 62° to 182° is shown in Table No. 2.

As in the San Diego tests, the only adverse condition noted is in the slightly increased time required for a given performance and this becomes negligible when faced with emergency service.

While the tests in San Diego and Faribault prove conclusively that mixtures of air and liquefied hydrocarbons can be substi-

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There are two Hackney cylinders in service for every one—of all others combined. That fact proves the lead that Hackney cylinders hold, and continue to hold.

Phillips, Skelly, Hope, Shell, Standard, and other leaders choose Hackney cylinders.

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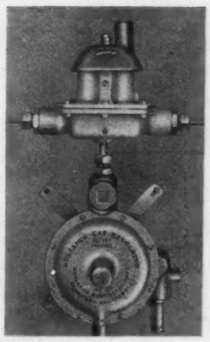
CONTAINERS FOR GASES, LIQUIDS AND SOLIDS

RELIANCE REGULATORS
for Automatic Control of Bottled Gas Fuels



Type MR
Patent No. 1,960,466

On the left is illustrated the spring loaded, canopy type MR Regulator with a secondary type BK Regulator. Above is illustrated the BK secondary type Regulator.

Reliance liquid petroleum gas regulators are recommended in duplex operating types for the best results. The primary MR regulator reduces extremely high pressures encountered in the service cylinder when first intalled to an intermediate pressure of from 3 to 10 pounds. The BK regulator then reduces this pressure to a uniform outlet pressure required for proper utilization which insures uninterrupted service to the appliances. The BK regulator can be operated independent of a primary regulator when manifold valves are employed.

Write for Bulletin No. 30 explaining in detail all types of Reliance Regulators and accessories designed for bottled gases.

RELIANCE REGULATOR CORPORATION
1000 Meridian Avenue
Alhambra California

tuted for natural gas in emergency operation with a high degree of satisfactory service. The practicability of the method depends upon several important factors.

The foremost among these factors are storage facilities and the replenishment of stocks of hydrocarbons, both of which are very serious problems in a plant of any considerable size.

When the necessary equipment is available, even though it be of insufficient capacity to figure strongly as stand-by, the method can be used in a sudden emergency to tide over until other equipment can be placed in operation.

At present market prices this method compares very favorably with production costs of the high B.t.u. oil gas recently developed in California as stand-by for natural gas. It becomes more economical as plants using it decrease in size and output.

We do not hesitate to recommend this method of stand-by for small plants or where the problems of storage and supply can be satisfactorily solved.

C.N.G.A. To Hold Its Fall Meeting November 1, 1934

SIGNALIZING eight years of successful cooperative activity, the California Natural Gasoline Association will hold a one day Fall Meeting at the Los Angeles Biltmore Hotel, Los Angeles, Calif., on Thursday, November 1, beginning at 9 o'clock in the morning.

The morning session, under the direction of P. S. Magruder, will consider reports from various committee chairmen covering the Association's cooperative technical studies on problems affecting the natural gasoline industry. Arranged in a novel and interesting manner the session will reveal the history, present status and future plans for such problems as:

(a) Gas deviations from Boyle's Law.

(b) Vapor pressure of absorption oils.

(c) New developments in charcoal test procedure.

(d) Progress in the standardization of correct methods of gas measurement.

(e) Preparations for the development of a table of physical constants for natural gas hydrocarbons.

(f) Development of a procedure for correctly guaging tank trucks.

(g) A.S.T.M. natural gasoline distillation procedure.

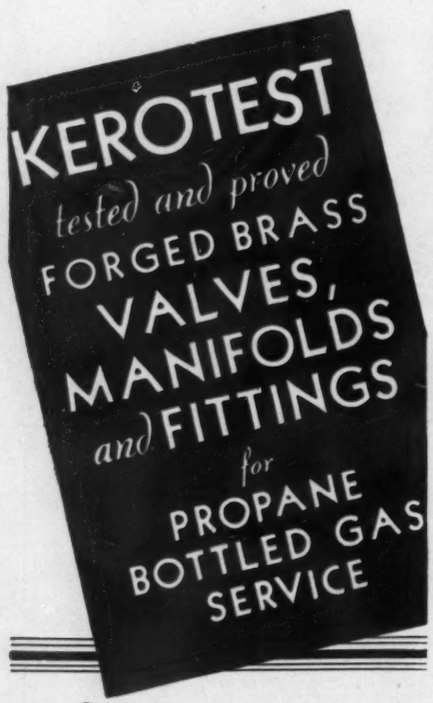
(h) Reid vapor pressure test.

(i) Specific gravity determinations.

At the afternoon session Dr. W. N. Lacey, professor of chemical engineering at the California Institute of Technology, will be the principal speaker and will deliver a paper on the subject, "Properties of Propane." This presentation will be of a great interest to natural gasoline men, refiners, research and liquefied petroleum gas engineers, plant operators, and chemists. Based upon experimental findings on work done for the A.P.I. the paper will reveal a wealth of information which those engaged in gas work have long wished was available for practical use. Dr. Lacey intends to explain his findings in a manner which will show the various steps to be taken in attempting to apply propane data in a practical way to plant and engineering problems.

Supplementing Dr. Lacey's paper will be a series of short papers by E. R. Cox, E. G. Ragatz, W. L. Rifenberick. H. N. Wade, Frank West and others, bringing out the practical application of propane and related data to the solving of natural gasoline, liquefied petroleum gas, and vapor recovery plant problems.

The evening session will be given over to a banquet at 6:30 p.m., followed by entertainment.



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KEROTEST MFG. CO.
PITTSBURGH, PA.
KEROTEST

New Mexico Dry Ice Plant In Operation, New Wells In

The Witt Oil & Gas Co.'s new dry ice plant located between Estancia and McIntosh, New Mex., is now in operation with a daily capacity of 15 tons. Supply of carbon dioxide is coming from the company's two wells on Wilcox Dome. The second well which has just been brought in, has a flow of 648,000 cubic feet, and the first well 200,000 cubic feet daily. Construction is already being started on the company's second 15-ton unit, and additional units being built will raise capacity to 45 tons of dry ice per day.

Natural Gas Corp. of Oregon Sells Two More Properties

Natural Gas Corp. of Oregon early in October completed sale of The Dalles, Ore., plant to a local purchasing group headed by Grover Keller. Operations are to continue under the present personnel set-up, according to the new owners. Liquefied petroleum gas for the company's 280 customers will be purchased from the Natural Gas Corp. of Oregon, under a five-year contract.

Franchise for the service of natural gas in Klamath Falls was transferred early in October from the Natural Gas Corp. of Oregon to the Klamath Natural Gas Co., of which J. O. Stearns is president. The company has 38 miles of distribution system in the city.

Troy To Be On Butane Service In Spring, 1935

According to G. J. Hubbard, city clerk and treasurer, Troy, Ala., construction is scheduled to begin in the very near future on the municipal butane-air plant, with actual distribution anticipated for April, 1935. The plant will have an hourly capacity of 7,000 cubic feet of 530 B.t.u. gas at 5 pounds pressure. A rate of $1.80 per M c.f. will apply.

Plans and specifications for the new plant are in the hands of the Public Works Administration for approval. A loan of $68,400 for the construction of the plant and a 12-mile distribution system was granted late this summer. Troy has a population of 6,814.

Carbondale-Worthington Consolidate Interests in Refrigeration Field

Announcement has been made of the consolidation of interests of the Carbondale Machine Co. of Carbondale, Pa., with those of the Worthington Pump and Machinery Corp., in the general refrigeration field. Future operations will be carried on in the name of the Carbondale Machine Corp.

The Carbondale Machine Corp. is to transfer all necessary personnel and equipment to Harrison, N. J. and in the future will build its machinery lines at the Worthington plants.

New Orleans Welding Clinic Sponsored by Linde

A four-day welding clinic October 24-28 was held at the Isaac Delgado Central Trades School, New Orleans, La., by The Linde Air Products Co., New York City. The program featured demonstrations of new developments in welding and cutting equipment, applications of the oxy-acetylene process, instruction in all types of welding, and exhibits.

Butane Plant to Be Dismantled

The Mountain Grove (Mo.) Gas Co. plant which has been serving Mountain Grove with butane gas, has been shut down and will be dismantled in the near future, following a period in receivership.

Bushnell Butane Project Going Ahead

Construction is cheduled to begin immediately on the Bushnell, Ill., butane gas plant, financed by P. W. A. funds. Thirteen miles of new pipe line will be included in the project.

Compressed Gas Manufacturers' Annual Meeting

The annual Fall meeting of the Compressed Gas Manufacturers' Association was held October 18 at the Harvard Club in New York City. William Haynes, editor of "Chemical Industries," addressed the gathering on the ever-increasing importance of synthetic materials in industrial processes and in the manufacture of articles for everyday usage.

Dr. Hugo Lieber, the first president of the association, spoke briefly of the death on October 6 of J. R. Colby, former president of the association and until his death president of the Canadian Liquid Carbonic Corp.

Revise Code Authority Election

Revision of the method of electing a permanent Code Authority for the Liquefied Gas Industry is under consideration, according to word from N.R.A. headquarters. Members of the industry's Emergency National Committee, whose terms expired August 15, were reappointed to serve as a Temporary Code Authority until November 1.

Philgas "Big Game" Contest

A sales contest entitled "The Philgas Big Game Hunt" was run, during the six weeks from September 15 to November 2, by the Philgas Department of Phillips Petroleum Co. Sales of various sizes were given names of wild animals and prizes to successful "hunters" were awarded on a point basis.

Budget Approval Facilitates Code Enforcement

THE budget of the Code Authority for the liquefied petroleum gas industry, submitted to the National Recovery Administration in January of this year, has finally been approved by that body. Permission was also granted to the Code Authority to levy assessments on a prorata basis against members of the industry to cover the costs of administering the code and to make failure to pay such assessments a violation of the code.

According to Frank R. Fetherston, secretary of the Compressed Gas Manufacturers' Association and a member of the Code Authority, preparations are being made, as provided for in the code, to obtain from the industry statistics regarding gas sales revenue, compliance with safety requirements, etc. To date the Code Authority has been operating on voluntary contributions, but the approval of its budget makes possible a more vigorous enforcement of the code provisions and a more prompt and thorough notification of the industry of new developments in the status of the code as they occur.

Since July a petition for revision of the code has been in the hands of the National Recovery Administration at Washington, but as yet a hearing has not been docketed. At such time all interested parties will be officially notified. Assurance has been given that no provisions would be incorporated in a revised code which would not meet with the assent of the industry. It is believed that by revision a more satisfactory document could be obtained at this time, particularly as regards price-fixing clauses now included.

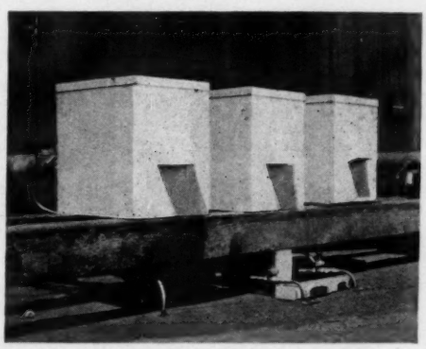
Petition has been made to the Code Authority to extend for one year the "reasonable time" provided for in the code for removal of bottled gas installations inside homes and buildings. Since this would extend the period beyond the duration of the National Recovery Act itself, the committee composing the Code Authority is expected to vote instead on an extension of six months, or until March 31, 1935. As evidence of the good faith of the petitioning members the committee would, in granting the extension, require from all members of the industry a statement of the number of inside installations removed prior to November 1, 1934, together with an estimate of the number of such installations still to be removed.

Parkhill-Wade to Construct Mono Tunnel Butane Project

Los Angeles Department of Water and Power early in October awarded contract to Parkhill-Wade, Inc., Los Angeles, to install butane plants at four construction camps on the Mono tunnel project, located about 65 miles northwest of Bishop, Calif. Parkhill-Wade also was successful bidder for the 3-year fuel contracts for the camps. Undiluted vapor type plants will be used.

New Okla. Natural Sapulpa Location

Oklahoma Natural Gas Co. early in October opened its new district office at Sapulpa, Okla.



This installation of three "GASAIR" units serves a town of 3,000 population with 900 BTU butane-air gas. Capacity 200,000 cu. ft. per day.

◆

Completely automatic
Requires no power
Proven Performance
Low Cost

EMERGENCY TYPE "GASAIR"
A small, inexpensive unit supplying a propane-air mixture that makes burner adjustments unnecessary in change-over or emergency standby. Costs less than running a by-pass. Write for details.

Less than **$100** per customer serves "non-gas" towns . . . . with the

"GASAIR"
BUTANE MIXER

New economy! New profit-fields for butane! New opportunities for gas appliance sales! These are proven promises of the "GASAIR" MIXER (pat. applied for) . . . soundly engineered and tested by successful installations.

Units may be scattered, near consumers. Small piping or copper tubing suffices for both tank connections and service lines. A ½ inch tube, conveying liquid butane, will supply B.t.u.'s equivalent to an 8-inch main for manufactured gas.

"GASAIR" installations cost as little as $90 per customer, for towns as small as 500 population, including butane tank and all equipment. Also ideal and economical for industrial and commercial use.

Write for folder, full particulars

UTILITY DEVELOPMENT CO.

JOHN K. HELLER, PRESIDENT

5815 THIRD STREET **SAN FRANCISCO**

Campaign to Regain House Heating Customers

A HOUSE heating campaign which placed special emphasis upon reclaiming former customers who had left off the use of gas due to depression conditions, was conducted during the month of September by Public Service Co. of Colorado. Information received from Roy G. Munroe last month indicates that the company's efforts were very successful in reaching these former users. During the month's campaign 231 customers agreed to discontinue coal and resume all-gas heating. In addition 190 new customers were sold gas heating equipment. With six removals of old customers and 11 cancellations of "resale" orders a net total of 404 house heating customers remained for the month.

At the outset of its campaign the company built a selected list of 1272 former users of all-gas house heating and assigned them to its 24 house heating representatives by territories. To insure that special effort would be exerted a full $10 gas revenue commission was allowed the salesman for each former customer who was induced to make any expenditure of money for labor or material to reconnect house heating equipment which had been discontinued. For every reconnected customer who was merely "resold" on the use of gas, without any expenditure for reconnection or purchase of equipment, 50 cents was allowed the salesman. These resales also counted in an important way toward bonuses and prizes set up for the campaign. In addition to the above commission revenues the representatives were paid 33 per cent of the gross merchandise profit on each merchandise order for equipment or labor and material.

In Mr. Munroe's opinion any sales activity designed to reach former house heating customers must rely primarily upon effective reselling of the comforts and conveniences of gas, with due emphasis upon any new conditions such as rate reduction. In Denver, with cheap local coal competition and 5860-degree-day seasons, gas costs the average householder a $4.00 monthly premium over coal per winter month, and good selling is required to awaken the recognition of the conveniences which justify this premium.

Missouri Decisions Hold P.W.A. Utility Financing Illegal

JUDGE Albert L. Reeves of the U. S. District Court for the Western District of Missouri, Kansas City, late in September handed down the second of two rulings blocking municipal light plant projects relying upon P.W.A. funds. The second ruling refused to dismiss a temporary injunction which he issued in July preventing the city of Trenton from proceeding with a municipal plant for which it planned to borrow $250,000 from the Public Works Administration, and was to receive a P.W.A. grant of $65,000. The town had voted $250,000 bonds to secure this loan.

Judge Reeves' earlier decision, on September 20, ruled that the town of Concordia, Mo., could not accept P.W.A. funds for a similar purpose. Missouri Public Service Co., operating a light plant at Concordia, brought the action. The city was asking a loan of $30,000 and a grant of $17,000.

In the Concordia ruling Judge Reeves stated "that the administration of public works had no constitutional authority to aid the defendants in the construction of the project and if it were intended by congress to promote that character of construction work under the industrial recovery act, then such purpose infringes upon constitutional inhibitions and is invalid." Judge Reeves pointed out that the Industrial Recovery Act was predicated upon the power of congress to regulate interstate commerce and that interstate commerce was affected neither directly nor indirectly by the building of a light plant at Concordia, Mo.

The court held the State has exclusive right to control the manufacture of electricity, and added: "It must follow that if congress has no power to control the generation of electricity as in the instant case, it would have no authority to grant aid to the construction of a plant over which it would have no legislative authority."

34 Gas Wells for Michigan Since January 1

NEW natural gas wells of commercial size completed in Michigan during the first nine months of 1934 number 34, with an estimated initial potential production of 108,239,400 cubic feet per day, according to a report "Oil and Natural Gas Situation in Michigan as of October 1, 1934" issued by the Utilities Information Bureau. This record for nine months compares to 10 gas wells completed in the 12 months of 1933 with an aggregate estimated initial production of 57,128,000 cubic feet.

Twenty-eight of the 34 new wells were in pools now being drawn upon for commercial service, 20 being in Broomfield pool, 6 in Vernon, and 2 in Austin. The remaining 6 were "discovery" wells indicating the location of at least four "possible" new commercial pools in Mecosta and Montcalm counties.

Natural gas production and utilization during the nine months, including casing head gas used in the production of gasoline, has been at the rate of approximately 8,200,000 cubic feet per day.

Twenty-five Michigan communities with a population of approximately 226,000 persons will be served with natural gas when Muskegon and Muskegon Heights are added to the list in November.

Morse DellPlain Resigns Presidencies for Welsbach Street Lighting Post

Morse DellPlain

Morse DellPlain, president of the Northern Indiana Public Service Co., Hammond, Ind., resigned this position October 15 to become vice-president of the Welsbach Street Lighting Co. of America, Philadelphia, Pa.

Mr. DellPlain has also resigned as president of the Gary (Ind.) Heat, Light and Water Co.; Indiana Service Corp., Delphi, Ind.; and the Indiana Hydro-Electric Power Co.

Municipal Power Projects Must Show Rate Saving to Get P. W. A. Help

According to a statement issued September 28 by Secretary of the Interior Harold Ickes, Public Works Administration aid will only be rendered municipally or publicly owned power projects when they are able to provide electric rates lower than those provided by private utilities. The statement was prompted by action of several mid-west utilities in sections where municipal projects financed by P.W.A. funds were under way, reducing rates under the levels contemplated for the municipal projects. The Secretary stated, however, that no municipal power plant would be deprived of public works support until local governments were satisfied that private company rate reductions would be permanent.

Victor G. Vaughan Manager of Spencer Thermostat Co.

Victor G. Vaughan, until recently manager of the appliance engineering division of Westinghouse Electric & Manufacturing Co., has joined the Spencer Thermostat Co., Attleboro, Mass., as manager, and is now in charge of all operations including development of new products. In addition to long service with Westinghouse Mr. Vaughan spent a short period as engineer with Magnolia Petroleum Co. He holds some 40 patents in the line of his work. In his new association he will apply his knowledge of design and mechanics in the field of house thermostats and heating and temperature control devices.

New Valve Products by Chaplin-Fulton on Market

Chaplin-Fulton Mfg. Co., Pittsburgh, Pa., has issued a new bulletin, No. 4146, on its line of high-pressure soft seat inside valves, and its "V-Port" inside valves. Copies are available upon request to the company.

Sunbright Natural Gas Franchise Let

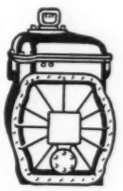
Russell Producing Co., Sunbright, Tenn., has been granted a certificate of convenience and necessity by the Railroad and Public Utilities Commission of Tennessee, to serve natural gas in Sunbright.

AMERICAN METER CO
EST 1836
MEASUREMENT ENGINEERS

aids to good service

TINNED STEELCASE METERS

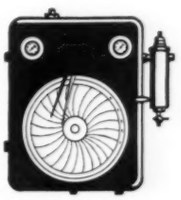
INTEGRATING ORIFICE METERS



IRONCASE METERS

WET & DRY TEST METERS

BASE PRESSURE & BASE VOLUME INDEXES



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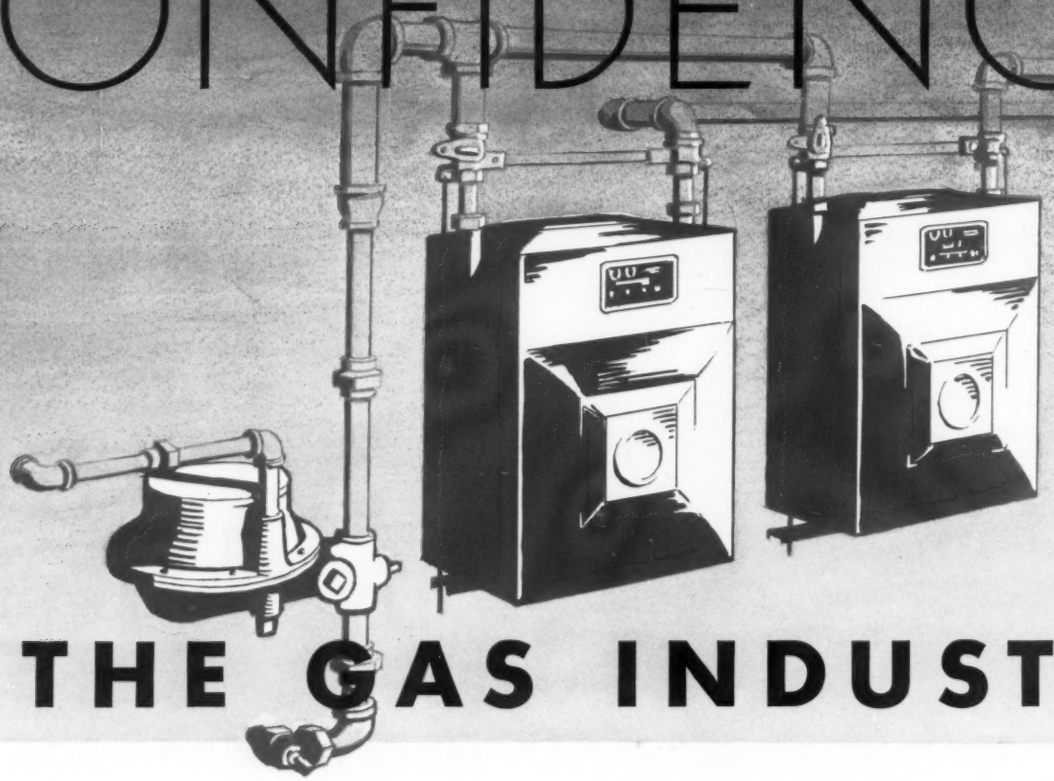


IN THE GAS INDUSTRY

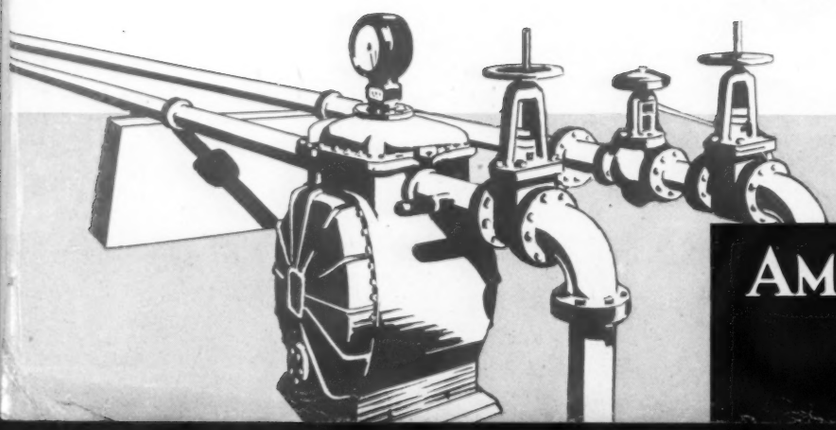
WE SALUTE THE ALERT GAS COMPANY EXECUTIVES WHO ARE DEMONSTRATING LEADERSHIP in the modernization of ranges, appliances and metering as a means of keeping the gas industry in step with the van of progress.

Loads are being increased . . . customer good will is being strengthened.

In terms of simple economics, meter modernization not only is giving gas companies the advantage of the larger capacities of today's meters, but it is also definitely assuring savings on maintenance for years to come.

Advanced developments in both design and materials are minimizing preventable causes of removal due to premature failure of obsolete equipment. This reduces customer complaints and stimulates further confidence in gas company equipment.

American Meter Company products and service are calculated to net you the greatest possible return on your meter dollar.



BOOTHS 400-401
A.G.A. CONVENTION

AMERICAN METER COMPANY
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EST. 1836

Modern Application of Pressure Control

By D. M. HILL
*District Manager, The Foxboro Company**
Los Angeles, California

PRESSURE control is an old story for gas men. The advent of natural gas presented new problems compared with those of the artificial gas industry, calling for the need of satisfactory pressure regulation from many hundreds of pounds to eventually ounces, or even inches of water. Most problems have been pretty satisfactory solved, but improvements in regulating devices and new instrument designs are evolved from time to time which aid further in the solution of these problems.

D. M. Hill

Leakage is another old story, much discussed and written about, even in the days of "cheap gas," when the transmission line meters showed too much unaccounted-for. In these days of higher prices for natural gas and the call from the management to watch all leaks—financial and gaseous—more consideration is given to a study of minimum system pressures consistent with satisfactory operation. In order to hold leakage at a minimum, it is usually desirable to hold the pressure in a system at the minimum. Obviously this minimum allowable pressure is governed by the pressure requirements at the point where it is most difficult, or most important, to maintain sufficient pressure. To maintain the desired pressure at such a critical point, it may be necessary to vary the pressure at the point of regulation through wide limits to overcome the changing pressure drop created by the line at different flows.

Sometimes the pressure drop between the point of regulation and the point in the system where it is most difficult to maintain a satisfactory pressure is negligible. In such cases the problem is merely one of taking care of the regulator opening required at different flows without changing the control point and without hunting. To decrease the amount of change in control point and to eliminate cycling, a pressure sensitizer may be advantageously applied to a weight-loaded regulator. This instrument is obtainable in either recording or non-recording type. The installation is made about as shown in Fig. 1, the diaphragm motor lever and the regulator arm being linked by a chain between points X and Y so that the travel A of the motor lever arm is a little greater than the required travel B of the regulator arm. The regulator is not changed in any way; the equalizing line C is left connected. Weights in excess of those needed to hold the desired pressure are added to the regulator arm, and the sensitizer, when put in operation, maintains the desired pressure by causing the diaphragm motor lever to exert a lift equivalent to the removal of the necessary regulator weights. Such a set-up gives much closer control, and in case of failure of the automatic controller mechanism, the diaphragm lever arm is lowered by the spring, releasing the regulator arm and permitting the regulator to function at a safe high pressure.

When the pressure drop between the point of regulation and the point in the system where it is most difficult to maintain a satisfactory pressure is variable, the problem falls into one of two classifications:

First, those in which the load and pressure requirements vary on a predeterminable time schedule.

Second, those in which the load and pressure requirements change without warning and without a predeterminable schedule. In some cases, the location of the critical point in the system may be very definitely established; in other cases, the location of this point may change from hour to hour, depending upon the load distribution of the system.

For the condition outlined under the first heading, two alternative courses are open. The most common procedure is to set the pressure high enough to take care of the worst conditions likely to occur before the next visit of an operator or attendant to change regulator weights. This procedure may be extremely costly because of the increased leakage resulting from the excessive operating pressure. In one instance, the needless leakage in a single system was equivalent to $2600 every three months.

The other alternative is the installation of a time pressure controller to save this waste, as it did in the instance mentioned above. (See Fig. 2.) The amounts that will be saved in a given system may be estimated from the data, instructions and formulae in U. S. Bureau Of Mines Bulletin 265, "Leakage from High Pressure Natural Gas Transmission Lines." By subtracting the leakage computed on the basis of present operating pressures from that computed on the basis of the ideal time pressure schedule, one can quickly determine how long it will take to pay for the investment in a time pressure controller.

For the condition outlined under the second heading, when the load and pressure requirements change without warning and without predeterminable schedule, satisfactory minimum pressure conditions at the critical point can be obtained by means of

*Presented before the Southern California Meter Association, July 25, 1934.

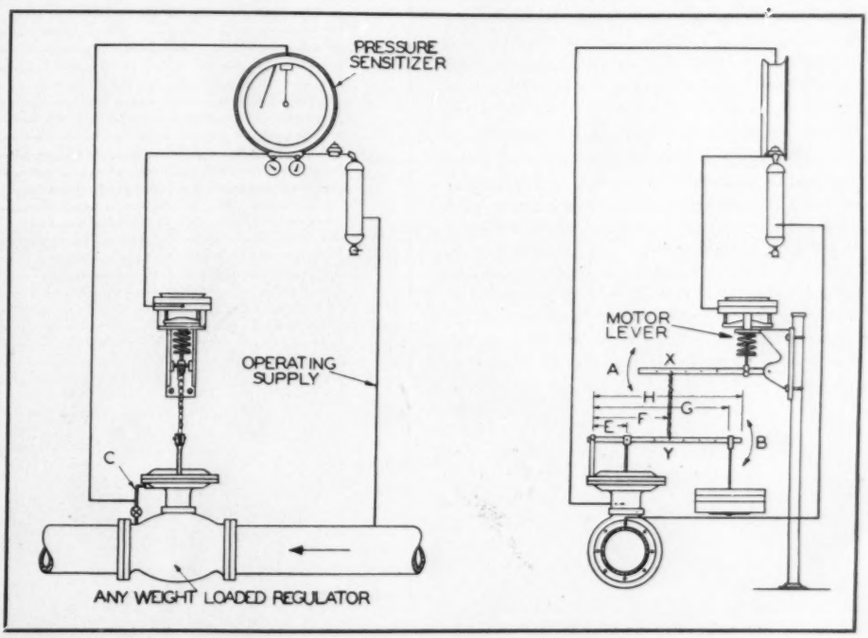


FIG. 1. Pressure Sensitizer on Gas Regulator.

FIG. 2. Foxboro Time Pressure Controller.

long distance pressure control. Various pressure demand control schemes have been tried, but these would appear to be limited in their field of usefulness; first, because they will not take care of the difficulties created by intermediate draw-offs; and second, because if the operating pressures are sufficiently high for the effect of line pack to be appreciable, an increase in pressure control point will result in an apparent temporary increase in load, which the instrument attempts to compensate by a further increase in control pressures.

The long distance pressure controller designed by The Foxboro Co. eliminates both of these difficulties by operating directly from the point, or points, at which control is desired. Such a design was made possible by the advent of the Foxboro Stabilog system of control. Due to the nature of the problem, a system of long distance pressure control must be able to operate successfully against unfavorable lags caused by the length of time between an upsetting condition or change of demand and the correction applied at the regulator or source of supply, which again balances the system.

Unfavorable lags require fairly wide throttling range in a control instrument in order to obtain smooth control, but unfortunately a wide throttling range alone cannot give close control under variable loads. Fig. 3 may clear up this point. Let the heavy horizontal line C represent the desired pressure in the center of band T, which is the throttling range, throttling zone, band of control, or band of regulation, as it has been called by various writers. Dotted line A represents the position of the sensitive element within the throttling range for various valve openings from fully open at position (1) to fully closed at position (5). Let us assume that conditions are such that the one-half open position of the valve satisfies the demand; then this position on line A coincides with line C, and control is at the desired point. If, however, the demand changes, the valve must assume a different position of opening to balance the new demand. The point on line A, representing the new position of valve opening, is now the control point, and as long as the new conditions remain constant, the valve opening will remain at the new position and the control point will not be on the desired line C. The amount of deviation from the desired control point is of course proportional to the width of the throttling range T. In most cases of pressure control the absence of unfavorable lags, and the presence of a favorable capacity lag, permit good control with a narrow throttling range, and hence deviation is not so readily noticeable. This condition is of course present in all types of throttling control, whether they be temperature, liquid level, rate of flow, humidity, etc.

The Stabilog was designed to overcome this difficulty of furnishing throttling control and maintaining a fixed control point under varying conditions of demand. The essentials of this system of control are first, a throttling range which can be adjusted to suit practically all conditions of unfavorable lags, and second, a follow-up mechanism which prevents change of control point. This follow-up mechanism functions to reset the throttling range with respect to the desired point of control at a rate suitable for the particular process involved. In effect, the throttling range is moved about the control point, instead of the control point moving within the throttling range.

The design of the long distance pressure controller, as finally worked out, is shown in Fig. 4. A is the standard Foxboro Pressure Stabliog with diaphragm motor lever D operating a Wheatstone bridge. This is the transmitter, and is located at the critical point in the gas system. Telephone lines connected with the receiver locate it at the source of supply. In operation, the resistance F and F-1 of two sides of the Wheatstone bridge is varied by the diaphragm motor lever according to the pressure supplied to it by the Pressure Stabilog. The variation in resistance of the Wheatstone bridge causes a deflection in the galvanometer in H, which is the receiving relay. The design of this instrument is such that the pressure on the diaphragm K is proportional to the galvanometer deflection. Accordingly, the pressure on diaphragm motor lever K is proportional to the pressure on diaphragm motor lever D, but it is not necessary that these two pressures be the same. By calibration of the two instruments they may be different, but the deflections will always be proportional. This permits the use of lower pilot pressures at the demand end of the line (as low as 5 lbs.), and permits using line gas for pilot operation at both points.

As can be seen from the figure, it was decided to transmit valve position or regulator setting from transmitter to receiver, since errors due to variations in temperature along the transmitting wires would occur at a slow rate, and could therefore be corrected or compensated for by the controller. It was also decided to use the regulator already installed, instead of a controlled valve of the spring loaded type ordinarily employed for automatic control. In addition to the saving in expense, this provided the safety feature previously mentioned in discussing the time pressure sensitizer. Additional safety features are incorporated in this system. For example, the Wheatstone bridge arms are arranged so that the resistance on one side is decreased, while that on the other side is increased. This means that the open circuit position of the galvanometer in receiver H may be at any desired position along the scale. In case of an open circuit in the telephone line transmitting system, the galvanometer will swing to this open circuit position, and receiver H will then maintain a pres-

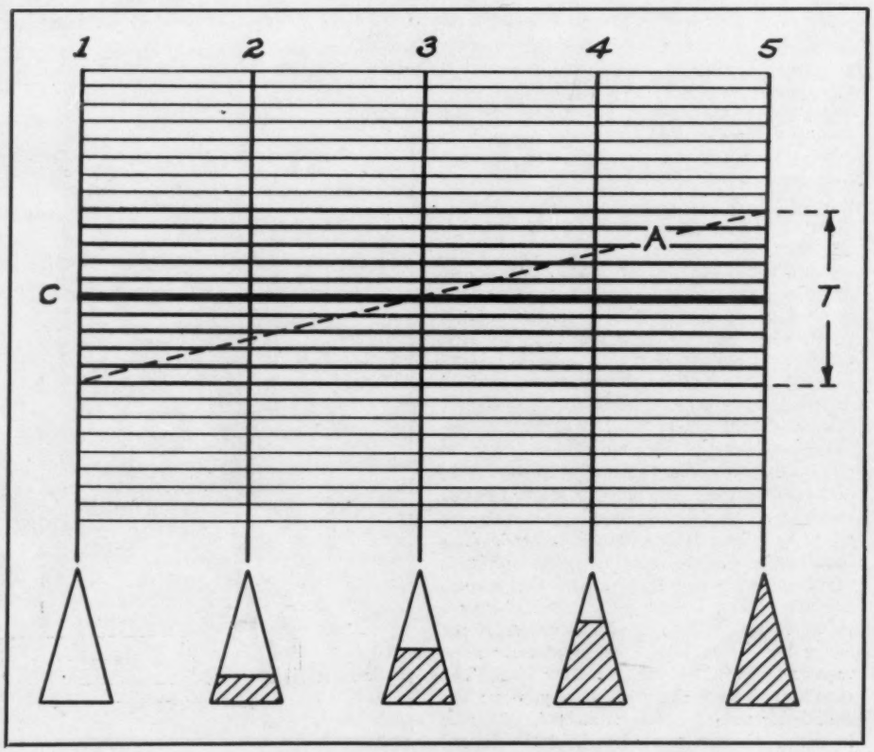


FIG. 3. Throttling Range Control.

sure on diaphragm motor K corresponding to that selected position. By varying the relative resistances of F and F-1, this position can be made such that the regulator will hold a desirable safe operating pressure on the inlet end of the line. Similarly, if the transmitting line should be shorted for any reason, the bridge circuit is arranged so that the galvanometer will deflect to the end of the scale, tending to give a high safe regulator set point. Provisions are also made for failure of operating pilot pressure at either sender or receiver. If the operating pressure fails at sender A, the diaphragm motor will open circuit the transmitting telephone lines, thereby causing the receiver H to set the safe high regulator control point. If operating pilot pressure fails at H, the diaphragm motor lever at that point will move its arm down and allow the full weight to be effective, again setting the regulator to control a safe high pressure.

This system of control can be used to operate from two or more critical points in the system, tieing the various transmitters in together so that the point in the system calling for the higher pressure at the source of supply would be the point actually controlling the entire set-up. Each transmitter could be arranged to open circuit its own part of the telephone system whenever the pressure on its diaphragm motor lever became zero. This would happen if one transmitter was trying to carry a higher pressure at the regulator than any other. This would always be the case, since in practice the demand through the branches of the system would never necessitate exactly the same pressure at the branch to carry the set pressures at both ends.

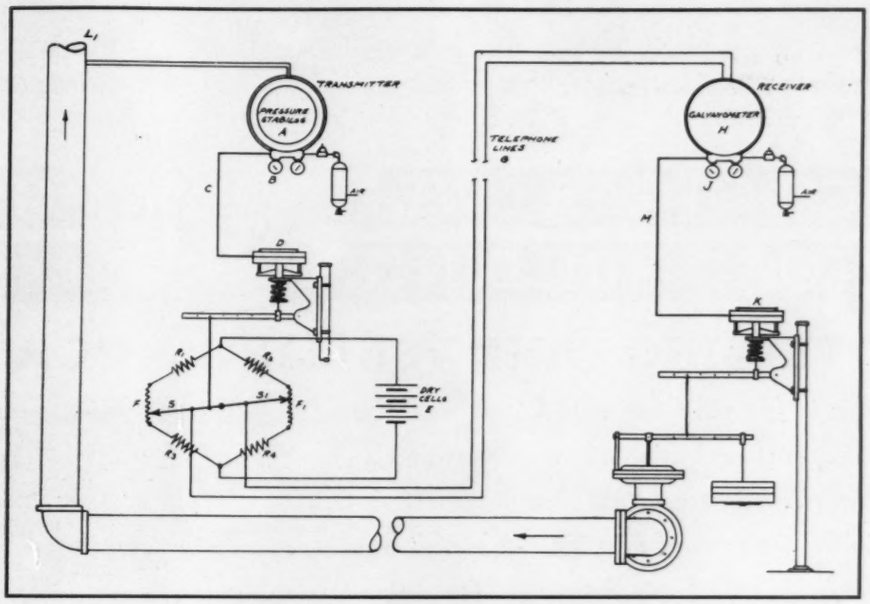


FIG. 4. Long Distance Pressure Control.

What would happen is that the transmitter which required the higher pressure at the regulator would always be in command. If the load shifted to another branch sufficiently to cause the transmitter there to call for a higher pressure, this transmitter would automatically assume command of the receiver, and the first one would go on open circuit. The installation would thus automatically control from the point calling for the greatest supply from the receiver.

An Occupational Hazard from Darkest Africa

From a recent issue of "The News Meter", company publication of the San Diego (Calif.) Consolidated Gas and Electric Co., *Western Gas* appropriates this literary gem, recounting an "accident" which befell a gas company worker. Safety departments would do well to read and heed.

"To Phil Pappert, turn-on-off man, goes the prize for the most unusual accident. A buxom Ethiopian Amazon had ordered her gas and electric meters shut off. Evidently under the exhilaration of potent spirits she had forgotten this little detail. As Pappert was standing on an elevation shutting off the electric meter, the ebony frail approached from the rear, clasped him about the knees with her arms and elsewhere with her teeth. After a brief interlude of complete muscular and oral paralysis on Phil's part and of locked gnashers on the part of the dusky dame, she finally unclamped her ivories and lifted Phil's quivering carcass to the ground. Phil stood not on the order of his going, and it's a cinch that he sat not on it, either."

Pittsburgh Equitable Announces Booklet on Improved Product

A new 12-page bulletin describing the Emco Type B ejector service regulator has recently been issued by the Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

Three definite improvements of Emco service regulators have been effected without materially changing the previous design and construction. Effective automatic loading, low shut-off and increased capacity have all been made possible, according to the company, through a study of the flow stream of gas as it emerges from the valve, correct proportioning of the spring, and the use of the Emcomold valve.

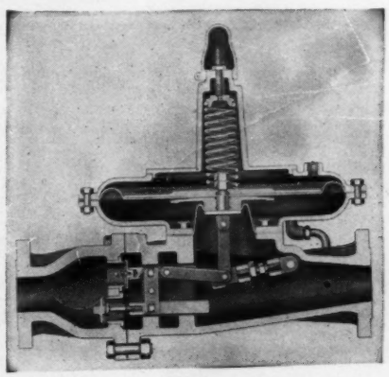
Copies of this bulletin may be secured by writing the company at 400 North Lexington Ave., Pittsburgh, Pa.

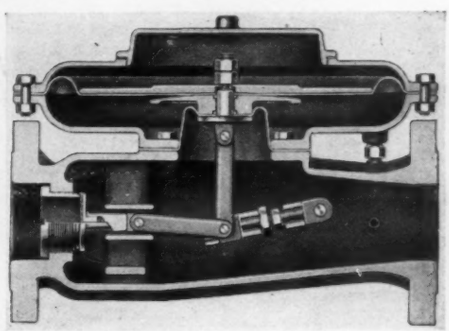
Improved Industrial Regulators Announced by Reynolds

Reynolds Gas Regulator Co., Anderson, Ind., has announced two new industrial control regulators, some of the outstanding features of which are: removable valve pocket and orifices, side hand hole, streamlining that directs the flow of gas, pressure reduction from pounds to pounds and pounds to inches W.C. Interchangeability of diaphragm casings for pounds to pounds or pounds to inches W.C. may be obtained through the last named feature.

The regulators are equipped with removable inlet spool with orifices, permitting installation of various size orifices while regulator is in pipe line. They are built in single and double balanced valve construction, and may be had in either spring or dead weight adjustment, with or without pilot control.

The new industrial control regulators will be on display at the company's booths, No. 322-323, during the American Gas Association Convention exhibit in Atlantic City, October 29-November 3.





ABOVE: New Reynolds industrial regulator, with spring adjustment. AT RIGHT: Model with dead weight adjustment.

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J. EARL JONES.....SEATTLE GAS CO.
A. C. JOY (CHAIRMAN).....P. G. & E.
D. L. SCOTT.....L. A. G. & E. CO.
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1934 P·C·G·A

HEADQUARTERS:
PACIFIC COAST GAS ASSOCIATION
447 SUTTER STREET, SAN FRANCISCO

WM. MOELLER, JR., PRESIDENT
CLIFFORD JOHNSTONE, MNG. DIRECTOR

CO-OPERATIVE LOAD-BUILDING MONTHLY NEWS . . . . AND VIEWS

"TELLING AND SELLING" COAST INDUSTRIES

This is the sixty-first consecutive month of co-operative trade journal advertising by the gas industry of the Pacific Coast . . . **telling** the story of a better, quicker, cheaper fuel . . . **selling** gas through testimonials of satisfied users.

• • • •

"MODERN AS TELEVISION" . . . "Western Confectioner & Ice Cream News" carried this message, featuring the model, gas-equipped plant of **Welch's Candy Limited, Los Angeles.**

MODERN
AS TELEVISION
This model factory of WELCH'S CANDY, LIMITED (Los Angeles) radiates MODERNITY from "studio" to salesroom.
Gas-fired equipment includes: water heater; heating tables; four candy kettles (one, surface-combustion); two cream and chocolate mixers; three cream and chocolate melters.
Says Welch's, through Mr D Gordon Ross. "We have used gas for all heat purposes for several years have found it to be the cleanest fuel (important to any food products manufacturer) as well as the most economical. Exact temperatures are essential to best results in every operation; therefore, gas, being flexible and easily controlled, is better adapted to candy manufacture than any fuel we know of."
If you are using less modern equipment, get comparative fuel-facts from your gas company's Industrial Engineers. Their technical service is free.
Quick Clean Economical Gas the modern industrial fuel
PACIFIC COAST GAS ASSOCIATION, INC.
(A non-profit service organization of which your Gas Company is a member)
447 SUTTER STREET, SAN FRANCISCO, CALIF.

SUBSTANTIAL SAVINGS . . . In "Architect & Engineer" and "California Arts & Architecture" appears this convincing statement by the manager of San Francisco's **Cathedral Apartments.**

WHY SEATTLE'S MAYFLOWER COOKS WITH GAS . . . The manager of this leading hotel calls gas, in no uncertain terms, "the best all-around fuel." Published in six hotel and restaurant magazines.

INSPIRATION FOR CHEF'S ART—The "Mayflower's" modern kitchen (all gas, of course!) Ranges have insulated ovens, thermostat control. Other gas appliances: 4-deck bake oven; steam table; salamander broiler; 2 coffee-urn burners.

WHY SEATTLE'S MAYFLOWER COOKS WITH GAS

"The use of gas in our coffee shop is the result of experience which proves it is the best all-around fuel for this type of service"—R. P. WARD, *Manager, Hotel Mayflower*

CLEANLINESS · FLEXIBILITY · SPEED · ECONOMY

The *cleanliness* of gas fuel is a big factor in maintaining our strict standards of kitchen sanitation. Its *flexibility* and *speed* enable our chef to get the exact heat he wants, instantly. All contributing to tasty meals and satisfied, enthusiastic customers.

"With gas, we realize *economies* not attainable with other fuels. Burners are shut down during slack hours. Yet, thanks to gas speed, we can serve customers just as rapidly as when ranges are on full."

Mr. Ward's experience is typical. See the new gas appliances displayed by your gas company or dealer *get the facts* and you too will change to gas.

Beautiful Italian renaissance lounge, created in $25,000 transformation of former "Bergonian" to new "Mayflower."

Quick Clean Economical Gas the modern fuel

PACIFIC COAST GAS ASSOCIATION, INC.
(A non-profit service organization of which your Gas Company is a member)
447 SUTTER STREET, SAN FRANCISCO, CALIFORNIA

CATHEDRAL APARTMENTS, SAN FRANCISCO
Architects, Weeks & Day *Gen. Contractors*, Cahill Bros.

• • •

Gas is unsurpassed in "recoverable" (effective, usable) BTU's* per dollar of cost, for practically every known heat requirement.

*BTU (*British Thermal Unit*)—Standard of heat measurement. Heat required to raise temperature of one pound of water, one degree Fahrenheit.

Quick Clean Economical Gas the modern fuel

PACIFIC COAST GAS ASSOCIATION, INC.
(A non-profit service organization of which your Gas Company is a member)
447 SUTTER STREET, SAN FRANCISCO, CALIF.

SUBSTANTIAL SAVINGS

GAS HEATING gives perfect satisfaction to management and tenants in this de luxe hotel-apartment building (one of San Francisco's finest) atop exclusive Nob Hill. Two and one-half years' experience with gas is summed up by Mr C W Gaskell, Resident Manager:

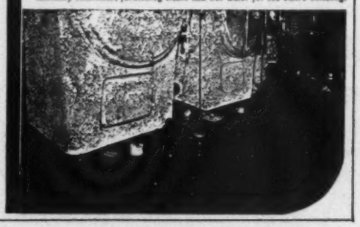
"Substantial savings have resulted from the change to gas including a cleaner building decreased maintenance costs longer life for drapes, carpets, furnishings a finer residence for our tenants.

Also, automatic regulation enables our engineer to give virtually undivided attention to the apartments, rather than to the engine room. In our experience, gas is the ideal fuel."

In specifying modern gas equipment, properly installed, you insure this same lasting satisfaction. Your gas company gladly offers the services of its technical staff for consultation.

• • • •

HEATING PLANT. *2 steel boilers, with vertically-fired gas burners . . automatically controlled, furnishing steam and hot water for the entire building.*



With the ASSOCIATIONS

Del Monte Sessions Inaugurate 42nd P. C. G. A. Year

As William Moeller, Jr., president-elect of the Pacific Coast Gas Association, took the gavel of office from past-president George Egleston at the conclusion of the Del Monte convention, his first official act was to set a slogan for the Association's 42nd year. "Keep Gas Service Sold" is the watchword in P. C. G. A. territory for 1935. The emphasis in the Association program, says President Moeller, will be laid on improvement in customer contacts and service standards.

The convention suffered no ill-effects from the sudden postponement of convention dates, which placed the meetings October 9-12, a month later than the time originally set. In fact, the 1934 annual meeting will go down in the minds of the 300 west coast gas men attending it as one of the most constructive ever held under the P. C. G. A. banner. Official registration was 259, and the fact that 245 attended the annual banquet concluding the meeting the evening of October 12 indicates that interest continued high throughout the three-day sessions.

The 1934-1935 administration of P. C. G. A. affairs will rest in the hands of the following, brought into office at Del Monte:

President—William Moeller, Jr., vice-president, Southern California Gas Co., Los Angeles.

Vice-President—H. M. Crawford, sales manager, Pacific Gas and Electric Co., San Francisco.

Treasurer—D. G. Martin, auditor, Pacific Gas and Electric Co., San Francisco.

Managing Director—Clifford Johnstone, San Francisco.

Directors:

W. J. Bailey, president, Day & Night Water Heater Co.
F. M. Banks, general superintendent of sales, Southern California Gas Co.
O. L. Dickinson, superintendent gas department, San Joaquin Light and Power Corp.
H. L. Farrar, president, Coast Counties Gas and Electric Co.
George P. Egleston, general manager, H. R. Basford Co.
L. M. Klauber, vice-president, San Diego Consolidated Gas and Electric Co.
N. R. McKee, vice-president, Southern Counties Gas Co.
B. H. Parkinson, commercial manager, Portland Gas and Coke Co.
T. E. Roach, vice-president and general manager, Washington Gas and Electric Co.

Following are the names of those heading the sections for the coming year:

Accounting Section: J. M. Bourus, general auditor, San Diego Consolidated Gas and Electric Co.

Commercial Section: Frank Talcott, division sales manager, Pacific Gas and Electric Co.

Manufacturers' Section: E. L. Payne, vice-president and general manager, Payne Furnace and Supply Co.

Public Relations Section: R. R. Blackburn, supervisor personnel, claims and safety, Southern California Gas Co.

Publicity and Advertising Section: J. S. Spaulding, advertising manager, Los Angeles Gas and Electric Corp.

Technical Section: A. R. Bailey, division superintendent, Coast Counties Gas and Electric Co.

Organization of committees within the six sections is already proceeding. This year the annual Organization Conference, customarily held in November at San Francisco, will be dispensed with due to the lateness of the convention. A series of sectional meetings in Los Angeles will be next on the calendar, programmed for early spring.

A few major committee appointments have already been announced for the Commercial and Technical Section. Mr. Talcott, for the Commercial Section, has appointed Louis Wollenberger, Coast Counties Gas and Electric Co., chairman of the Industrial Sales Committee, and W. M. Jacobs, new business manager, Southern California Gas Co., as chairman of the Domestic Sales Committee.

Mr. Bailey has announced three appointments for the Technical Section, H. W.

Mid-West Gas School and Conference at Ames

THE 14th Mid-West Gas School and Conference is scheduled for November 12-15, inclusive, at Iowa State College, Ames, Iowa. The conference is sponsored jointly by the Mid-West Gas Association and the Iowa State College. R. L. Klar is chairman of the committee in charge. Arrangements for a complete display of distribution, production, and metering equipment are under the supervision of Assistant Professor L. W. Mahone, Engineering Extension Service, Iowa State College.

The following papers will be presented this year:

Liquefied Natural Gases for Stand-by Purposes—R. L. Rundorff, Northern States Power Co., Minneapolis, Minn.

Burning Characteristics of Various Gases and Substitutes—R. B. Harper, Peoples Gas Light and Coke Co., Chicago, Ill.

Necessity For Use of Service and Appliance Regulators—Allen D. MacLean, Pittsburgh Equitable Meter Co.. Pittsburgh, Pa.

Leakage Survey and How to Attack the Problem of Leak Reduction—H. E. Peckham, Northern States Power Co., St. Paul, Minn.

Design of Gas Meters — A. L. Fritchey, Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

Selecting the Correct Size Regulator and Pressure Regulation in its Broadest Sense—K. D. Wolfe, Fisher Governor Co., Marshalltown, Iowa.

Proving and Testing of High Pressure Positive Displacement Meters and Orifice Meters—F. I. Thompson, American Meter Co., Chicago, Ill.

Technical Analysis of Fundamental Principals Involved in the Orifice Meter—L. K. Spink, The Foxboro Co., Chicago, Ill.

Production of Blue Gas as a Base Gas for Mixing—C. E. Nordstrom, Sioux City Gas & Electric Co., Sioux City, Iowa.

Servicing Electrolux Air-Cooled Refrigerators—Tom Connor, Peoples Gas & Electric Co., Mason City, Iowa.

Measurement of Gas in Large Volumes—J. L. Griffin, Northern Natural Gas Co., Omaha, Neb.

The sessions will take the same form as in former years, with time allowed each session for inspection of exhibits. During the inspection period representatives of manufacturers will have an opportunity to explain the operation of their products. Exhibits are limited to production and distribution apparatus, no domestic appliances being permitted.

1934 Calendar

November

American Petroleum Institute—1934 Annual Convention, Baker and Adolphus Hotels, Dallas, Texas, November 12-15.

Mid-West Gas School and Conference, Mid-West Gas Association—14th Annual Short Course, Iowa State College, Ames, Iowa, November 12-15.

Annual Exhibitors' Night, Southern California Meter Association, Los Angeles, Calif., November 22.

Wisconsin Utilities Association—Technical and Operating Sections, Madison, Wis., November 22-23.

Geyer, utilization engineer, Southern Counties Gas Co., as chairman of the Utilization Committee; Norman L. Hoff, assistant engineer, Los Angeles Gas and Electric Corp., chairman of the Distribution Committee; and P. E. Beckman, assistant engineer of production, Pacific Gas and Electric Co., who will succeed himself as chairman of the Natural Gas Transmission Committee.

The Manufacturers' Section will continue in service for the coming year the officers elected at the 1933 convention. These are:

General Section Chairman—E. L. Payne, Los Angeles; Vice-Chairman—Andrew Kerr, San Francisco.

Gas Range Division: Chairman—Clarence Graham, Newark; Vice-Chairman—W. C. Gaffers, Los Angeles.

Space Heater Division: Chairman—J. M. Williams, Los Angeles; Vice-Chairman—A. J. Hartfield, Los Angeles.

Central Heating Division: Chairman—L. Cinq-Mars, San Francisco; Vice-Chairman—R. G. Logue, Los Angeles.

Water Heater Division: Chairman—W. J. Bailey, Los Angeles; Vice-Chairman—R. C. Hoyt, Oakland.

AWARDS

Recognition for outstanding work done by individuals and committees during the past year was conferred in the report of the Awards Committee, which gave the Basford Trophy to the Technical Section of which Frederic A. Hough, distribution engineer of the Southern Counties Gas Co., was chairman. This trophy is held annually by the Section judged to have done the most valuable work during the year.

One gold medal award was made, to Wm. A. Lewis, tax accountant of the Southern Counties Gas Co., for his paper entitled "New Provisions of the Revenue Act of 1934 and Their Effect Upon Gas Companies."

Honorable Mention awards were made for a number of papers and reports, listed below:

"House Heating"—a paper presented by E. L. Hall, Portland Gas and Coke Co.

"Coordination of Paper Work Between Purchasing, Receiving and Disbursing Departments"—a paper presented by J. Q. Ewing, assistant auditor, Southern Counties Gas Co.

"How Manufacturers Can Cooperate with Utilities for Greater Sales"—a paper presented by A. F. Rice of H. R. Basford Co.

"Heating Value of Natural Gas by Calorimeter"—a paper presented by M. A. Richford of the Pacific Gas and Electric Co.

"Cast Iron Service Connections"—committee report, H. S. Harris, chairman, Los Angeles Gas and Electric Corp.

"Internal Corrosion and Dehydration"—committee report, A. B. Allyne, chairman, Southern Counties Gas Co.

"Pilot Lights"—committee report, Guy Corfield, chairman, Los Angeles Gas and Electric Corp.

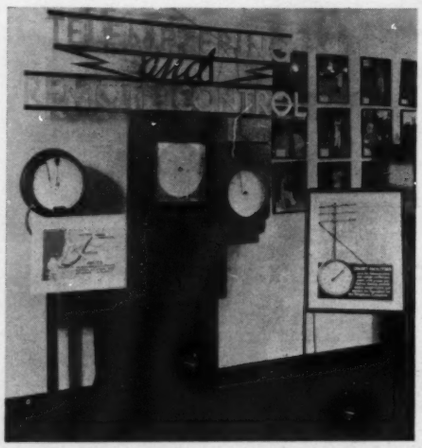
"Pipe Protection"—committee report, Wm. R. Schneider, chairman, Pacific Gas and Electric Co.

"Major Interruptions to Service"—committee report, W. M. Henderson, chairman, Los Angeles Gas and Electric Corp.

SIDELIGHTS ON PROGRAM

President Egleston called the convention into session at 10:30 Tuesday morning, October 9, and a message of welcome prepared by A. F. Hockenbeamer, president of the Pacific Gas and Electric Co., was read by H. M. Crawford, P. G. and E. sales manager, in Mr. Hockenbeamer's enforced absence.

Mr. Hockenbeamer's remarks gave due attention to selling more gas as the utility's chief problem, expressing the thought that the sale of appliances is as deeply the utilities' concern as it is that of the manufacturer, jobber or dealer. Present importance of the Federal Housing Act as a solution for credit problems in appliance purchasing was stressed as "The greatest opportunity for the sale of major home appliances ever presented to the gas industry." The F. H. A. program, incidentally, was before the convention on several occasions and it was recognized that gas companies must tie in their efforts speedily if gas is to get its share of the market created by liberal credit provisions of the Federal program. In this connection readers



Telemetering and remote control exhibit at the Del Monte convention.

will find interest in an article beginning on Page 9 of this issue, dealing with several tie-in programs and covering the P. G. and E.'s extensive activity in some detail.

In his presidential address Mr. Egleston, as a representative of the gas appliance branch of the industry brought a valuable viewpoint to the convention. He called upon all elements in the industry to raise a defense against current socialistic activities which now have the utilities as their particular target but which ultimately may endanger all business.

The consumer is king in the gas company today, and rightly so, said Mr. Egleston. He made timely criticism of the tendency to so centralize management that executives are out of touch with customers.

The utility future calls for service- and sales-mindedness. Regarding dealer outlets as vital to the sales scheme, the gas company must control appliance quality, and must assist in dealer financing to put gas appliances on an equality in installment buying with other home commodities. Present significance of the Federal Housing Act was stressed in this connection.

Through the Association gas companies were urged to set a standard of serviceability in appliances, below which they will not go; to pay prices yielding a fair manufacturing profit; to bear a share in initiating cooperative research for appliance improvements.

The dealer, said Mr. Egleston, is sometimes a thorn in the industry's flesh, as an individual, but collectively he is just "one of us trying to make a living." The gas company must rightly define the dealer's place, neither regarding him as a competing outsider, nor ascribing to him a God-given right to do all the merchandising in the community.

In the report of the Board of Directors, read by Managing Director Clifford Johnstone, encouraging reference was made to improvement in amount of gas sales and number of customers. Publication of the Gas Engineers Handbook, a monumental piece of work which will reflect prestige upon the Association for many years to come, occurred during the past year. Congratulations were extended to the committee headed by Frank Wills of the Pacific Gas and Electric Co., for successful conclusion of the task. Mr. Johnstone also reviewed work conducted with the manufacturers in connection with their Code, and also covered the excellent progress made in dealer trade relations during the past year.

Load-building received its usual heavy share of attention on the general sessions. One outstanding paper bearing on the subject was that by Paul M. Downing, vice-president and general manager of the Pacific Gas and Electric Co., on "Inducement Rates as an Aid to Load-Building." Mr. Downing at the outset modified his title to insert the word "profitable" ahead of load-building, for any added load which does not carry a share of profit is better not added. Mr. Downing referred to the present confused economic reasoning which calls for utilities to reduce their rates to a point where their capacity load would be absorbed, apparently losing all sight of the need for profit in the process. The theory is not tenable that a distributing company can constantly take present losses in the hope of eventually restoring earnings to former levels through increased usage. Projected far enough this results in a vicious circle with bankruptcy the ultimate result.

In the course of his remarks Mr. Downing pointed to the Federal government's threatened "yardsticks" and merchandising of electrical appliances as activities which may find a parallel in the gas industry if the trend continues.

In his remarks on "The Market for Gas" H. M. Crawford, sales manager of the P.G. and E., stayed closely to his subject and presented an excellent discussion of sources for market data, with particular reference to the domestic field. He gave examples of information obtainable from the Federal census and other general surveys, urging that utilities keep informed on what commodities the customer is spending his money for. An outline was given of survey work conducted by one utility using its own salesmen to gain specialized data on unsold markets for gas appliances.

"Employee Education brings Public Goodwill and Added Load" was the topic spoken to by H. L. Farrer, president of Coast Counties Gas & Electric Co. In these "public utility be-damned" times, said Mr. Farrar, the utility requires better educated employees than in normal times. After living down a reputation for callous treatment of the public, utilities are now again on the defensive, though unjustly so, and employee education

COOPERATIVE BUSINESS DEVELOPMENT

Single-handed sales promotion has been replaced by genuinely cooperative business development. Dealers are now using all the assistance they can get and are clamoring for more. They're even banding together among themselves to put on cooperative campaigns. It's no longer either fashionable or profitable to be an "isolationist." Team work is the order of the new day. And it works.

Your business can be developed by cooperative measures. Join hands with us in our United Industry campaigns. Take an active part in the affairs of your Gas Appliance Society. Do both consistently and you'll find your sales-curve mounting steadily upward.

DEALERS

P. G. and E.

PACIFIC GAS AND ELECTRIC COMPANY

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FRASER

Radiant Front Console

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The heater that smiles while it warms

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The reason for the long life and low maintenance cost of cast iron pipe is its effective resistance to rust. Cast iron is the one ferrous metal for water and gas mains, and for sewer construction, that will not disintegrate from rust. This characteristic makes cast iron pipe the most practicable for underground mains since rust will not destroy it.

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offers the best means at hand for correcting the condition.

Larger companies, especially, must compensate for the necessary specialization in employee duties by proper education to inform the whole employee body on fundamentals of policy and utility economics. The employee should know something of the costs of service, of depreciation, interest, overhead, and of rate structures.

Mr. Farrar spoke of the tip-bonus plan so frequently used to encourage non-sales employees to aid in load building, expressing the view that a company with the right type of interested personnel can expect sales leads from its employees as a routine duty, with rewards coming in the regular pay check.

Employees should know something of gas appliances and their operation. Particularly is this true of electric employees in a combination company. Some electric employees, said Mr. Farrar, still contend that it is possible to cook as cheaply with electricity as with gas;—they need education.

Most utilities are alert to give their personnel the necessary technical information, and they should be equally alert to teach the responsibilities for building business goodwill.

M. D. Lack, manager of the Pacific Gas and Electric Co.'s tax department, brought the general sessions a discussion of "The New California Tax Structure," referring to the Riley-Stewart Amendment adopted at last year's State Legislature which placed utility property on the general tax rolls. Utilities in California since 1910 have been taxed exclusively for State purposes. Theoretically the levy was a property tax arrived at by taking a percentage of gross receipts. However, while property values remain virtually constant this percentage grew from an original 4 per cent to the present 9 per cent. Mr. Lack dealt with the preliminary valuation of utility property now under way, stating that utilities must now list their property by tax districts, of which there are 10,000 in California. One redeeming feature of the former system was its simplicity of administration.

Under the new set-up subdivisions containing publicly owned utilities, instead of going tax free on utility property as in the past, will now have to pay an additional State tax rate without receiving compensating local tax income from private utility properties.

A.G.A. WELL REPRESENTED

Three staff workers of the American Gas Association participated in the Convention program, in the persons of George W. Bean, Washington representative; Capt. A. E. Higgins, Field Representative, and Dr. F. E. Vandaveer of the Laboratory staff. Dr. Vandaveer's contribution is commented upon in connection with the Manufacturers' Section meeting. Capt. Higgins, also secretary of the A.G.A. Natural Gas Department, brought information to the convention on the important cooperative activity which the Chicago Gas Appliance Society has under way, with particular regard to gas range promotion. A motion picture developed by the Society for use in sales training was projected and its background recounted by Capt. Higgins.

Col. Bean's subject was "The World's Largest Buyer", in which connection he reviewed two and a half years of Washington representation for the A.G.A. The United States government's purchases are double those of any other government, and the contact work with the many bureaus involved is exceedingly complex. As an example, the present administration has created 49 new departments and commissions, all of them having some bearing upon purchasing. Since inauguration of the Washington Office all government bureaus now secure prices on gas before fuel contracts are entered into. Present sales to the government represent over 300 contracts and 18 billion cubic feet annually.

One general session was given over to a Customers' Relations Conference presided over by R. E. Fisher, vice-president of the Pacific Gas and Electric Co., and chairman of the Public Relations Section. Practical reports on such items as the conference method of employee training, public relations audits, and collection policies in depression times were submitted and general discussion developed around them.

Another general session under the auspices of the Public Relations Section was that of Wednesday evening, featured by the annual speaking contests. The contest this year was on the subject of "The Importance of Load Building to the Company, to the Employee and to the Consumer." First place in the men's competition was won by Ray Watts of the San Diego Consolidated Gas & Electric Co.; second place by F. P. McGovern of the Pacific Gas and Electric Co. Gladys Warren of the San Diego company won first in the women's contest, with Cleora McGuire of Southern Counties Gas Co. second place winner.

San Diego Consolidated made a grand sweep of contests at this year's Convention, also winning the Women's Committee Year Book contest. Louise Berger was chairman of the San Diego Women's Committee. Virginia B. Slover, Women's Committee chairman for San Joaquin Light & Power Corp., submitted the year book which took second prize.

MANUFACTURERS' CONTRIBUTION

Evident at the Convention was the increasing importance of the Manufacturers' Section as a working unit in the P.C.G.A. organization.

Presided over by General Chairman El Roy Payne, the Section at Del Monte staged its most ambitious meeting program to date, which compared very favorably with the offerings of other Sections.

The paper by A. F. Rice of H. R. Basford Company on the subject "How Manufacturers Can Cooperate with Utilities for Greater Sales" was a highlight on this program. Mr. Rice gave a frank discussion of the mutuality of interest between manufacturer, dealer and utility and went beyond the field of generalities in his recommendations. He stated that manufacturers should recognize as never before the vital need for utility promotion to keep gas appliances on a par with competing nationally advertised home furnishings. The manufacturer, since he controls the quality, convenience and public acceptance which is built into the appliance, and also within limits governs the cost factor, is in a strategic position to influence helpfully or harmfully the whole trend of trade practice. He knows the retail problem and can assist the utilities in securing maximum out-

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"BLUE BOOK"
Personnel Directory of the Gas Industry

1934 EDITION

This directory gives the personnel of gas utility district offices as well as headquarter companies, arranged by states and including distributing companies, pipe line companies, producing companies and holding companies. Each distributing company lists the kind of gas served — pressure—B.t.u. content—number of meters—and indicates whether or not each company merchandises.

Correct as of January 1, 1934, it is the most complete and up-to-date directory available—includes the entire United States.

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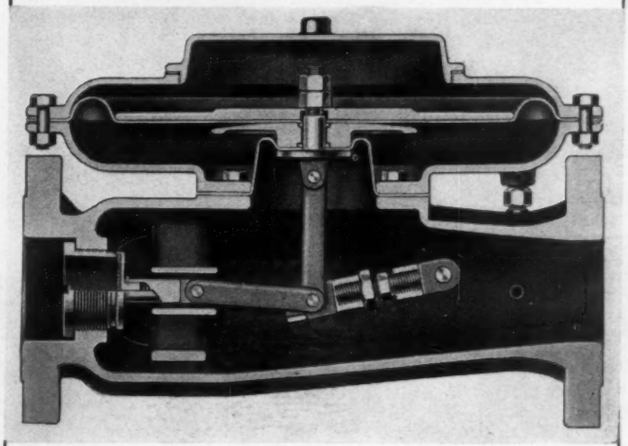

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G. H. Unekefer, 428 Boyd St., Los Angeles

let through this channel and at the same time maintaining harmonious dealer relations.

Specifically, Mr. Rice urged that manufacturers support utility activities; that they recognize it is impossible for any utility to handle all products; that so long as utilities maintain fair price standards in a quality promotional market they essentially benefit dealer channels. Manufacturers should sell this last thought to dealers and should always avoid arousing dealer antagonism toward utilities, realizing that the only effect of opposition is to deprive the industry of utility aid. Dealer requirements may be helpfully interpreted to the utilities. Manufacturers should avoid urging the gas company into untenable merchandising offers which disturb market conditions.

While expressing the opinion that utilities should leave the field of cheaper appliances strictly for the dealer, Mr. Rice raised the question, "How long can manufacturers expect the utilities to hold the umbrella of price and profit maintenance, at the risk of ridicule or the charge of profiteering?"

The practice common among some manufacturers of "writing out" advertising and promotional expense to reach low price levels was condemned as a species of "hitch-hiking" on the utility. Every legitimate element in the industry must contribute to the future market, and it was urged that the Manufacturers' Section go on record favoring a policy of annual promotional expenditure; proof of such expenditure on some agreeable percentage could well be a proper basis for a manufacturer's request of utility support for his product.

It was also brought out strongly that no manufacturer should expect his product to be favored merely because it is locally manufactured. Good character, progressiveness, and consistent loyalty to the industry are more pertinent qualifications. As Mr. Rice stated the issue, "The Local manufacturer should not expect to be coddled by an industry he does not enhance by keeping out in front". This is no time to hedge the utility about with artificial restrictions, when the full power of utility promotion should be unleashed to stem the approaching tide of cheap power.

As a summarizing recommendation Mr. Rice suggested that the Manufacturers' Section agree upon standards relating to sales—covering such items as quality, profit standards, trade practices, etc.—as a basis upon which utilities might reasonably expect the full cooperation and defense of manufacturers. Prompt action was taken upon the above recommendation, a committee being appointed by Chairman Payne to go into the formulation of these suggested standards.

Another important discussion before the manufacturers' group was that presented by Dr. F. E. Vandaveer, supervisor of the Los Angeles A.G.A. Laboratory, who discussed recent changes in Laboratory requirements and the desirability of combined action by manufacturers in offering constructive criticism. In discussion following Dr. Vand-

(Continued on Page 64)

SATISFIED CUSTOMERS

■ Keep your customers satisfied by recommending and installing the Chronotherm*... the greatest achievement in the field of automatic heating. It provides unvarying temperatures and will entirely eliminate "Cold 70°", and save fuel by doing so. Minneapolis-Honeywell Regulator Co., 401 East 28th Street, Minneapolis, Minn.

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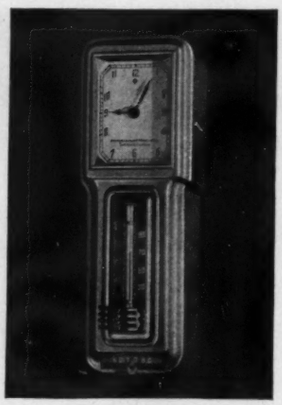

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Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.

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NRA — WE DO OUR PART

Gas Exhibit Gets Good Play at Metals Society Exposition

One of the finest expositions ever put on by the American Society of Metals was held at the Port of Authority Building, New York, N. Y., October 1-5. The focal point of interest was the Industrial Gas Section exhibit. The exhibit was sponsored by the American Gas Association in cooperation with some 19 gas companies. Eighteen manufacturers of industrial gas equipment displayed new and standard designs of appliances. Most of the exhibitors had furnaces and burners, large and small, lighted up and going full blast.

In the center of this composite exhibit was the booth of the American Gas Association. Industrial men were in daily attendance answering questions. On display was a most attractive set of dioramas on a circular revolving base. Each of these showed a different phase of industrial gas usage.

Acetylene Association to Hold Convention Next Month

The International Acetylene Association will convene in Pittsburgh, Pa., November 14-16. The William Penn Hotel has been announced as convention headquarters. Technical sessions of the convention will cover oxy-acetylene cutting as applied to steel mill applications, the metallurgical aspects of the oxy-acetylene welding process, pipe welding and testing, the application of welding to the transportation industries, and education and safety in welding. H. F. Reinhard is secretary of the association, with headquarters at 30 East 42nd Street, New York, N. Y.

J. F. Rooney, Now A.G.A. Treasurer

Joseph F. Rooney, assistant treasurer of the American Gas Association since 1929, has been elected treasurer to fill the unexpired term of the late William J. Welsh, by the executive board of the Association.

Mr. Rooney is assistant to the vice-president, Consolidated Gas Co. of New York. He has been a member of the Consolidated Gas organization for 20 years and has been an active participant in committee activities of the American Gas Association.

Wisconsin Utilities Section To Meet Alone

The proposed joint convention of the technical and operating section of the Wisconsin Utilities Association with the North Central Electric Association has been postponed, and preparations are being made to hold the section's sessions in Madison, November 22-23. Program arrangements for the gas division of the section are under the direction of H. B. Hummell, chairman.

Dorrill and Harper in Transfer

H. E. Dorrill has been made manager of the Wharton, Texas, office of Texas Natural Gas Utilities, succeeding J. O. Harper who has been transferred to Alice, Texas, as manager. The company headquarters at Houston, Texas.

Chicago Space Heating Campaign

(Continued from Page 17)

ond floor heating system, which is so prevalent in two-apartment buildings in Chicago. Provision also is made in this latter plan for making some $20 worth of repairs, air vent replacements, or the like, where necessary on each "package" installation.

Improvements in Burners and Installation Procedure: Late last winter a number of interdepartmental committees were appointed to study some of the problems which had arisen. As a result of these studies, a number of improvements were made in burner design and more particularly in installation procedure.

An important refinement, for example, is to have a representative of the testing department present at the time the shop inspector is making the final adjustments on new installations. The testing department representative with his Orsat apparatus determines the effect of any burner adjustment or baffling at once by means of a flue gas analysis.

Getting the Customer to Light His Own Burner: Another problem which might have become burdensome was that of lighting a large number of burners on the first chilly day in Fall. In order to avoid this condition, each customer whose burner was not provided with an outside lighting device was provided with a long brass taper and a set of simple instructions, to encourage the customer to light his own burner. The plan seems to have worked quite well, as the number of calls for lighting per day for this season has not exceeded last season's peak, although more than twice as many burners are in use.

Unit Heaters and Circulating Heaters: Due to the volume of sales expected and the cooperation of the manufacturers of the equipment, attractive new terms are being offered for these appliances and sales have been stimulated considerably.

Circulating space heaters, for example, are being offered with 60,000 B.t.u. input for $59.75, including a direct acting thermostat, and a safety pilot. The terms are $1.00 down and $1.00 per month, with a minimum payment of $9.00, regardless of how short the trial period might be. More than 2,300 of these heaters were sold in September of this year, in addition to 400 gas steam radiators.

Unit heaters, too, are being offered on attractive terms ($211.75 with monthly payments of $3.50 for a 100,000 B.t.u. heater), and many useful applications have been found for them. Valuable floor space and shelving rooms is made available by the use of unit heaters in stores and shops. In a number of instances, overloaded industrial steam plants have been relieved or the operating hours reduced by installing unit heaters in detached buildings or in portions of the larger buildings.

More than 900 unit heaters were sold in September.

Due to the intensity of the entire campaign, the sales force has been increased to

"MODERNIZE as you repair"

THE SPRAGUE METER COMPANY

BRIDGEPORT, CONN.

Los Angeles, Calif. San Francisco, Calif.

Davenport, Iowa

Newark, Ohio. Houston, Texas.

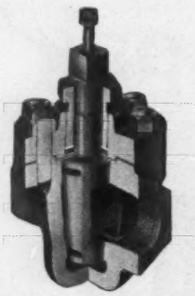
GENERAL CERAMICS COMPANY

• REFRACTORIES •

General Ceramics Refractories are made to exacting standards of accuracy and uniformity. That is why they are being used by the leading manufacturers of conversion burners, space heaters, and circulating heaters. Our engineers will gladly cooperate on new designs, alterations, production economies, etc.

General Ceramics Company, 71 West 35th Street, New York

NORDSTROM
Lubricated
PLUG
VALVES



Cut-away view of Nordstrom Lubricated Plug Valve. Made in sizes from 1/2" to 30", in various metals. Also made with face-to-face dimensions same as gate valves, 2" to 12" permitting installation without altering pipe dimensions.

MERCO NORDSTROM VALVE CO.
A Subsidiary of
PITTSBURGH EQUITABLE METER CO.
Main Offices: Pittsburgh, Penna.
Branch Offices, Warehouses in Principal Cities

HIGH QUALITY—LOW PRICE

AGP
AUTOMATIC
STORAGE GAS
WATER HEATERS

Three models of quality water heaters at a price range to meet any campaign requirement. Each combines the highest efficiency with improved principles of design and sturdy construction. Perfectly controlled, highly efficient, yet lowest in price for comparable quality.

A. G. P. made in galvanized or Everdur tanks—20-25-30-40-75 gallon sizes.

A. G. P. SPECIAL made in galvanized tanks—20-25-30-40-75 gallon sizes.

THE DICTATOR Low-Priced Water Heater is made in galvanized or Everdur tanks—15-20-30-40 gallon sizes.

Write for Literature

AMERICAN GAS PRODUCTS CORPORATION
40 West 40th St., New York, N. Y.
Division of
AMERICAN RADIATOR COMPANY

more than 260 men and some 75 supervising engineers and assistants.

Obviously, the task of the campaign has been to bring gas heat within the reach of the masses and to get the masses to "Try gas heat". No such campaign can hope to succeed unless the customer is given the best possible equipment at the lowest cost. In the selection and installation of equipment, therefore, and in the engineering work generally, this fact constantly must be kept in mind. For, as long as gas is selling at a premium as compared to other fuels, it is imperative that the service and satisfaction given to the user of gas heat be of such quality that the customer is more than willing to pay the necessary premium.

Appliances Institutes Elect New Committeemen

ELECTIONS at the annual meeting of the Gas Appliances Institute, held September 17-18, in Chicago, Ill., set up the following governing committees and administrative committees for the several member Institutes, for the year ahead:

Gas Range Institute

Governing Committee: S. E. Little, A. L. Lindemann, C. R. Graham, F. J. Hoenigmann, W. E. Stephen, Walter G. Nagle, R. M. Leach, R. B. Hurt, Paul R. Tappan, D. F. Kahn, M. P. Roper.

Administrative Committee: M. P. Roper, chairman; P. R. Tappan, vice-chairman; C. W. Berghorn, secretary and treasurer; A. W. Torbet, assistant secretary and assistant treasurer; C. R. Graham (West); M. Earl Ticen (Central); Roger A. Gordon (East).

Gas Water Heater Institute

Governing Committee: W. J. Bailey, J. P. Morley, R. H. Lewis, W. T. Rasch, Garry Sands, M. H. Feldman, F. W. Schuell, J. J. Whitehead, Jr., Frank H. Adams, R. E. James, W. H. Bowman, Jr., Scott Fowler.

Administrative Committee: W. T. Rasch, chairman; M. H. Feldman, vice-chairman; C. W. Berghorn, secretary and treasurer; A. W. Torbet, assistant secretary and assistant treasurer; W. J. Bailey (West); H. H. Dugdale (East); Garry Sands (Central).

Gas Space Heater Institute

Governing Committee: Carl E. Froelich, W. L. Sharpe, G. F. Reznor, J. S. Drillette, E. C. Adams, L. F. Ryall.

Administrative Committee: C. E. Froelich, chairman; W. L. Sharpe, vice-chairman; C. W. Berghorn, secretary and treasurer; A. W. Torbet, assistant secretary and assistant treasurer; J. M. Williams (West); James Mitchell (Central); F. W. Carter (East).

Gas Apparatus and Accessories Institute

Governing Committee: E. L. Payne, John H. Walsh, Arthur Sayly, Donald McDonald, Floyd Gaunt, John A. Robertshaw, H. A. Wilson, W. P. Hutchinson, J. S. DeHart, Jr.

Administrative Committee: Donald McDonald, chairman; H. A. Wilson, vice-chairman; C. W. Berghorn, secretary and treasurer; A. W. Torbet, assistant secretary and assistant treasurer; E. L. Payne (West); O. J. Leins (Central); F. W. Payne (East).

Gas Boiler, Furnace and Conversion Burner Institute

Governing Committee: W. S. Gordon, Jr., H. L. Whitelaw, Frank H. Adams, E. P. Bailey, Jr.

Administrative Committee: Frank H. Adams, chairman; E. P. Bailey, Jr., vice-chairman; C. W. Berghorn, secretary and treasurer; A. W. Torbet, assistant secretary and assistant treasurer; L. Cinq-Mars (West); Edwin A. Jones (Central); W. S. Gordon, Jr. (East).

The various administrative committees were elected by their respective governing committees.

W. R. McLaughlin With Sales Division of Pittsburgh Equitable

THE Pittsburgh Equitable Meter Co., Pittsburgh, Pa., announces that W. R. McLaughlin, prominent measurement engineer, has joined its sales organization.

W. R. McLaughlin

Mr. McLaughlin has been connected with the gas and oil industries in the midwest for the past 15 years and has had extensive experience to take with him in his new connection. In 1919 he joined the Arkansas Natural Gas Corp. at Shreveport, La., and was with this company during the period when proportion meters were being used for large deliveries; it was under his guidance that most of these were discontinued in favor of the then new orifice meter type of measurement. When the Cities Service Co. took over the Arkansas Natural Gas Corp. in 1928, Mr. McLaughlin was placed in charge of the newly organized measurement department. He has been selected as a member of the committee on the Southwest Gas Meter School at Norman, Okla., for several years, serving as chairman in 1933.

Mr. McLaughlin will be located in Dallas, Texas, where he will represent both the Pittsburgh Equitable Meter Co. and its subsidiary, the Merco Nordstrom Valve Co.

Completes 8,000,000 Cu. Ft. Well

Wyoming-California Petroleum Co., has completed an 8,000,000 cu. ft. daily open flow gas well in South Baxter Basin field, Sweetwater County, southwestern Wyoming.

Conversion Burner Lease Plan for Illinois Consumers

Illinois Power & Light Corp., serving gas in Jacksonville, Decatur, Champaign, Urbana and Danville, Ill., has announced a plan for these cities of leasing conversion burners for atmosphere heating of residences. Under the plan customers will lease the burner for at least one heating season, paying $2.95 per month for the use of the burner.

In the territories in which these lease plans are operating, bituminous coal is relatively cheap because of proximity of mines and the company management has felt that some inducement to prospective customers was necessary to cause them to adopt natural gas or mixed gas as a means of house heating.

The same plan of leasing burners is being adopted by the Des Moines Gas Co. and the natural gas division of Missouri Power & Light Co., affiliated interests of the company.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.

Required by the Act of Congress of August 24, 1912, of *Western Gas*, published monthly at Los Angeles, California, for October 1, 1934.

State of California,
County of Los Angeles—ss.

Before me, a notary public, in and for the State and county aforesaid, personally appeared Jay Jenkins, who, having been duly sworn according to law, deposes and says that he is the publisher of the *Western Gas*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher—Jay Jenkins, Los Angeles, Calif.
Editor—George H. Finley, Los Angeles, Calif.

2. That the owner is: (If owned by a corporation its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member must be given.)
Western Business Papers, Inc., Los Angeles, Calif.
Jay E. Jenkins, Los Angeles, Calif.
George H. Finley, Los Angeles, Calif.
James E. Jenkins, Los Angeles, Calif.
Craig Espy, Chicago, Ill.

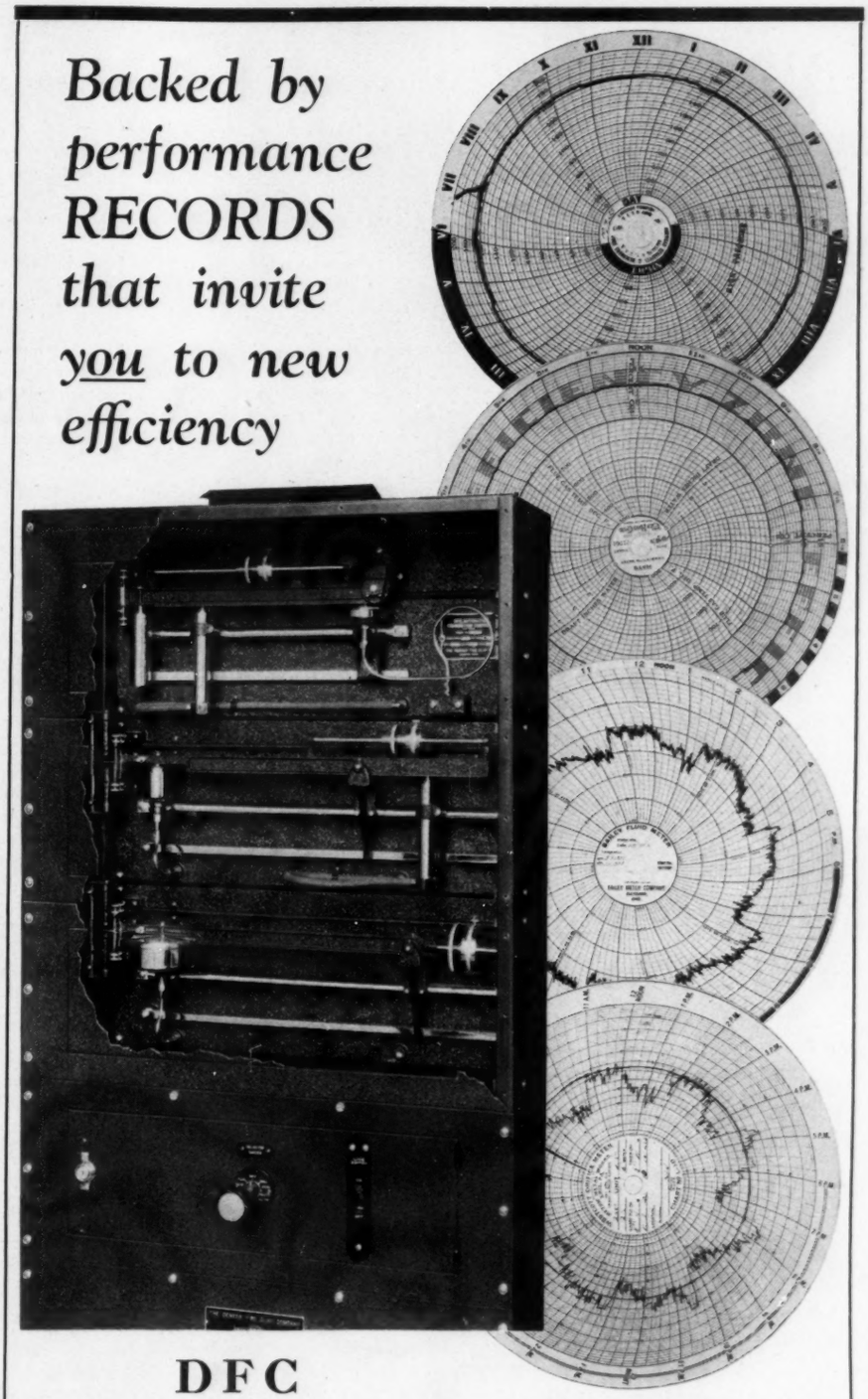
3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)
None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above is..... (This information is required from daily publications only.)

JAY JENKINS, Publisher.

Sworn to and subscribed before me this 21st day of September, 1934.
(SEAL) JOSEPHINE C. WHITING,
Notary Public.
(My commission expires March 25, 1936.)



DFC
Automatic Combustion Control

Offers YOUR plant a new, vital principle in automatic combustion control. Result—greater economy and efficiency. Don't fail to get complete information.

Write for Bulletin 320W

THE DENVER FIRE CLAY COMPANY
DENVER DFC COLO. U.S.A.
BRANCHES AT SALT LAKE CITY, EL PASO, AND NEW YORK

NEW *Sales Literature*

Now Available!

Pacific
GAS HEATING HEADQUARTERS

Our Line for 1934!

- **FLOOR FURNACES**
  - **CABINET HEATERS**
    - **WALL HEATERS**
- **GAS STEAM RADIATORS**
  - **RADIANT HEATERS**
    - **WATER HEATERS**
- **GRAVITY FURNACES**
  - **FORCED AIR FURNACES**
    - **UNIT HEATERS**

The Outstanding Gas Appliance Line of the Pacific Coast. Write for complete information on any or all items . . .

Pacific Gas Radiator Co.
Main Office and Factory
Huntington Park, California
Oldest and Largest Manufacturer of Gas Heating Appliances in the West

PROTECTION SUPREME
for Gas Holders and Pipe Lines

Thousands of miles of pipe lines and dozens of gas holders have been safe from rust for years under coatings of NO-OX-ID. Inquire regarding methods and costs, our NO-OX-ID Master Coat for pipe lines, NO-OX-ID Gas Holder Seal, NO-OX-ID Fillers over which paint can be applied, new reduced costs in cleaning and protecting corroded and pitted pipe, holders and other work.

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421 Bryant St., Phone SUtter 8688

NO-OX-ID
IRON-OX RUST
The Original Rust Preventive

Del Monte Convention Inaugurates 42nd P.C.G.A. Year

(Continued from Page 60)

aveer's presentation the importance of the Laboratory Seal, as evidence of merit, having a bearing upon adjustment of insurance rates, was developed. At the request of the Manufacturers' Section the convention later passed the following resolution:

"We recommend that the Gas Industry through its Associations petition all board insurance companies to recognize the American Gas Association Testing Laboratory and the Blue Star seal of approval in the same manner as they recognize the Underwriters Testing Laboratory and the Bureau of Standards Laboratory, and further, that there be made an adjustment of insurance rates recognizing the greatly lessened risk in homes and buildings which are fully equipped with A.G.A. approved appliances."

C. A. Swigart of the Pacific Coast Gas Association headquarters staff dealt with the important subject of manufacturers' codes, reporting on the recent Gas Appliances Institute meeting in Chicago. He also referred to recent court decisions in California which sustain constitutionality of the California Industrial Recovery Act and the National Industrial Recovery Act, and definitely usher in Court enforcement of Codes through both criminal and injunctive proceedings. Also favoring more effective Code administration is the recent grant of full power to the Code Authority to compel production of records by manufacturers. The thought was expressed that Code provisions relative to producing below cost, price filing, assessment payments, etc., are now more susceptible to enforcement than at any previous time. Marked improvement in the appliance situation in the East was ascribed to cooperation under the Code.

Little attention has been given programs of Accounting, Commercial, Publicity and Advertising, and Technical Sections, in the foregoing review of the convention. The past several issues of *Western Gas* either through publication in full or in digest form have covered many of the outstanding reports submitted to the Convention, and others will appear in future issues.

A new activity during the past year has been the work of the Technical Section's Utilization Committee for which Frank Wills, Engineer of Production, Pacific Gas and Electric Co., served as chairman. The field covered by this committee's work should grow into wide usefulness. During the past year an investigation of pilot lights was one research activity falling under the Committee's scope, under the chairmanship of Guy Corfield, Los Angeles Gas and Electric Corp.

A separate session of the Convention was given over to a utilization conference sponsored jointly by the Commercial and Technical Sections and presided over by Mr. Wills.

An important action was taken at the Convention relative to the Association's cooperative advertising program. The committee in charge of this activity was changed from a special committee reporting to the President to a committee of the Publicity and Advertising Section.

A committee made up of the chairmen of Commercial, Publicity and Advertising, and Public Relations Sections is charged with the task of formulating plans for coordinating the work of these Sections during the coming year.

Several exhibits provided Convention atmosphere. That of the Publicity and Advertising Section consisted of current gas company advertising. The Women's Committee exhibited year books from individual company committees. An outdoor working exhibit featured three of General Gas Light Co.'s new type 3,000-candle power gas lights. These lights were installed on the hotel lawn and burned 24 hours a day during the Convention. A telemetering exhibit was presented through cooperation of several manufacturers of remote control equipment and the Pacific Telephone & Telegraph Co. Over the lines of the latter company gas pressures on the meter station of the P.G. and E. at Hollister, 40 miles distant, were recorded at the Convention.

Convention golf events, run under the direction of Golf Chairman E. J. Hinchey, sales manager, James Graham Manufacturing Co., brought more than 50 into competition for the Babcock-Pedersen-Basford Trophy and a varied selection of special prizes. The tournament was conducted on Friday morning following the convention on the Del Monte course. Prizes went to the following:

Babcock-Pedersen-Basford Trophy, offered for low net—Won by A. B. Allyne, chemist, Southern Counties Gas Co.

Low gross—E. J. Strickland, Southern California Gas Co.

Class A (handicaps of 12 and under)—Low net won by E. J. Hinchey, James Graham Manufacturing Co.; second low net, G. H. Finley, Western Gas.

Class B (handicaps of 15-22)—Low net won by J. F. Gilmore, Republic Steel Corp.; second low net, C. E. Pickup, Southern California Gas Co.

Class C (handicaps of 23 and over)—Low net won by A. B. Allyne, Southern Counties Gas Co.; second low net, A. E. Hall superintendent, Standard Pacific Gas Line, Inc.

First, second and third prizes in a blind bogey went, respectively, to D. H. Perkins, San Diego Consolidated Gas and Electric Co.; F. E. Vandaveer, American Gas Association, Los Angeles Laboratory, and George Egleston, H. R. Basford Co.

To the Convention Committee, named below, goes the credit for another efficiently handled meeting. P.C.G.A. men have come to expect certain of these Convention Committee workers to take over the reins whenever Del Monte is named as Convention site, and they invariably exceed their past records in service. A special word is due Mrs. George P. Egleston, convention hostess, for her efficient and gracious handling of ladies' activities at the Convention. The Convention Committee was as follows:

General Chairman—T. W. Snell.
Hotel and Program Manager—W. J. Crabbe.
Entertainment—A. C. Miller, Chairman.
Registration and Banquet—P. S. George, Chairman; G. A. Peers; A. M. Reisen.
Men's Golf—E. J. Hinchey.
Reception and Attendance—Don C. Ray, Chairman; A. F. Rice; C. H. Potter; K. C. Tomlinson; W. M. Henderson.
Hostess—Mrs. George P. Egleston.

Job Training in a Distribution Department

(Continued from Page 20)

range," also showing his employee's badge as identification, if necessary. He should never speak of the call as "your complaint", but should substitute, "Your request for service." When entering the house, he should see that his feet are clean and should always remove his cap or hat.

3. When arriving at the range, service man should place the canvas on the floor and place tools on it. Also the canvas should be used for any special work to be done.

4. All of the gas cocks on the range should be inspected to see that they are closed and the oven door should be opened to see that there is no food or utensils in the oven.

5. The gas pressure at the range should then be taken before any other work is done. If the pressure is excessive and the regulator cannot be adjusted so as to hold a steady pressure, it should be changed before making any adjustments on the range.

6. Then the oven should be lighted so that it will have time to get up to a temperature at which it will cut down to a minimum flame.

7. The top burners should then be adjusted. Discuss pages 17 to 23, inclusive, and page 12 of the Gas Range Manual. This includes a discussion of and reference to charts showing:

a. The various parts of the gas burner.

b. The chart showing correct burner adjustment and the reasons for same.

c. Discussion of chart showing effect of flame height on the efficiency of the top burners.

d. Discussion of chart illustrating the effect of too much gas.

e. Discussion of chart illustrating the effect of not enough air.

f. Discussion of chart illustrating the effect of not enough gas.

g. Discussion of chart illustrating the effect of too much air.

h. Discussion of common complaints: (1) Burner smokes. (2) Burners make a loud noise when lighted. (3) Burner will not light at all. (4) Burner whistles. (5) Burner flame surges.

i. B.t.u. capacity of top burners and size of orifices required.

Demonstrate the different complaints and adjustments on the top burners of the ranges and have various service men readjust the burners to proper combustion.

Demonstrate installing an orifice insert and drilling to the proper size.

8. Discussion of top lighters, pages 33 to 37 inclusive, of the Gas Range Manual. Also demonstrate pilot adjustments.

9. The first step in adjusting the oven burner is to check the minimum flame and oven pilot. See pages 24 to 30 inclusive, of the Gas Range Manual and discuss the oven burner adjustment in class.

10. Inspect all burner cocks to see if they work freely and also inspect for leakage. Discuss the three different types of burner cocks as illustrated in the Gas Range Manual, pages 30, 31 and 32.

Also explain the proper way to lubricate burner cocks and the kind of lubricant to use.

11. Instruct service men to tighten all

Illustrating the ease with which the Type GA Burner can be swung into firing position.

N. G. E.
Type GA Burner

•

for small boilers, indirect fired ovens, furnaces.

The N.G.E. type GA burner was designed to meet the requirements of direct fired Dutch ovens. The conditions of poor draft and low gas pressure do not affect the efficient operation of this burner.

The Type GA is easy and safe to light and operate,—uniform in heat distribution,—affords perfect combustion,—has a large reserve burner capacity,—reduces fuel costs. It maintains a uniform quality of production, is clean and safe,—simple to adjust and has a dial valve which permits exact settings. All of these features effect economies in production costs.

The maximum capacity of N.G.E. Type GA Gas Burner is 7,500 cu. ft. of air per hour.

BURNER CAPACITIES

Calorific Value of Gas	Capacity in Cu. Ft. Per Hr.
2500 B.t.u. per cubic foot	300 cubic feet
1180 B.t.u. per cubic foot	700 cubic feet
850 B.t.u. per cubic foot	900 cubic feet
550 B.t.u. per cubic foot	1400 cubic feet

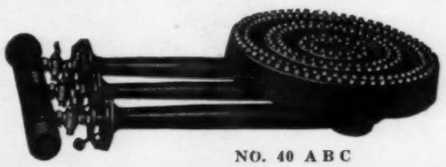
N.G.E. Gas Burners
N.G.E. Liquid Level Controllers
N.G.E. Wilgus Gas Fuel and Pressure Regulators
Webster Radiant Gas Burners
Janitrol House Heat Machines

NATURAL GAS EQUIPMENT INC.

Petroleum Securities Bldg. Los Angeles — 1123 Harrison St. San Francisco — Arizona distributors Crane Co.

LOOK TO THE PIONEERS FOR CONTINUED LEADERSHIP

HIGH QUALITY RING BURNERS



NO. 40 ABC

The Johnson 40 ABC Triple Atmospheric Ring Burners are made up of three independent ring burners which may be used singly, in pairs, or in triple. These burners are powerful, durable, and efficient. Embody many exclusive Johnson features. Write for details.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

WESTERN REPRESENTATIVE—
C. B. Babcock Co.,
135 Bluxome St.,
San Francisco, Calif.

EASTERN REPRESENTATIVE—
C. E. Barba,
3111 West Allegheny Ave.,
Philadelphia, Pa.

panels, door handles, catches, etc., and demonstrate how this should be done.

LESSON II

1. Discussion of Information that a service man must be prepared to give the customer relative to gas ranges and their proper use. This information may be requested by the customer or tactfully volunteered when an opportunity is offered.

a. The best way to clean enamel.

b. A good solution for cleaning top burners.

c. Advise to pre-heat insulated ovens.

d. The proper way to place pans in the oven so as to get the best distribution of heat.

e. How to operate the oven heat control.

f. How to operate the clock controlled ranges.

g. How to maintain the maximum heat while broiling.

Also a discussion of ways of saving gas as outlined in the Gas Range Manual, pages 14 and 15.

2. Discussion of and adjustment of oven heat controls. See pages 40 to 75, inclusive, of the Gas Range Manual.

This includes a discussion of and demonstration of:

a. Lorain Oven Heat Control.

b. American Oven Heat Control, Angle Rod Type and Straight Rod Type.

c. The Thermolator Oven Heat Control.

d. The Heat Master Control.

e. Patrol Oven Ignition System.

f. Robertshaw Oven Heat Control.

g. Standard Gas Equipment Corp. Type FD Oven Heat Control.

h. Wilcolator Oven Heat Control.

LESSON III

Practice adjusting thermostats. This will be principally a laboratory period. Each man or each two men will be assigned a range on which they will check and adjust the thermostat.

They should each turn on their oven and put the thermometer in and then be reassembled for about 20 minutes of instruction while the ovens come up to temperature. This instruction might well consist of a general review answering and discussing questions brought up by the class.

At the end of the 20 minutes, the men will return to their ranges, check the temperature and calculate the correction necessary. Then all of the men will gather around each range in turn and the man who is adjusting that range will explain what he found wrong and will then properly adjust the thermostat.

LESSON IV

Discussion of the operation and servicing of clock control ranges.

A brief discussion of the necessity for cleaning up the customer's premises before leaving.

This lesson to be concluded with a 20-minute examination.

Questions comprising the examination given at the end of the gas range course were the following:

GAS RANGE COURSE EXAMINATION

Name..... Date.....

1. Can proper adjustment be made if the burner ports are plugged?

2. Should the air shutter screw be tightened after adjusting the burners?

3. Give two reasons for gas fluctuating at the burner.

4. What is the B.t.u. capacity of the standard top burner?

5. On the usual Firefly lighter about how high should the pilot flame be?

6. Should the permanent pilot on an automatic lighter be a blue or yellow flame?

7. If the minimum flame in the oven is too high what will be the effect on the operation of the thermostat?

8. On a rod and tube thermostat does the rod expand and contract or the tube?

9. Can a cold calibration be made on a Lorain oven regulator?

10. Where is the temperature correction made on a Lorain oven regulator?

11. If the oven regulator will not shut off the gas what is likely to be wrong?

12. If burner valve is not lined up straight with the mixing chamber and the gas goes in at a slant, can proper adjustment be made? What correction, if any, would remedy this?

13. How long should be required to make a hot check of an oven temperature regulator when it is set, say at 400° F.?

14. Should a female customer be addressed as "Lady" or "Madam"?

15. Mention three ways that the customer may save gas in operating the range.

16. Can you adjust a burner correctly if orifice is too large even if you can adjust the orifice to cut down to a low flame?

17. After gaining entrance to the home and inspecting the burner cocks and interior of oven, what should be done next?

18. Should a wrench or pliers be used in adjusting a gas orifice cap?

19. What is the best way to clean the enamel on the gas range?

20. How many degrees change in temperature does the turn of one face of the end of the Robertshaw regulator tube represent?

REMARKS: Write briefly any comments or suggestions about this class. Have you gained any information from the instruction given?

"Convince Yourself Plan" Offered Davenport Consumers This Winter

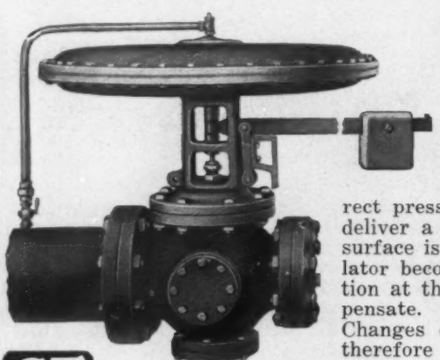
Peoples Light Co., Davenport, Iowa, has inaugurated a "Convince Yourself Plan," offering customers natural gas heat during the coming winter for a furnace-burner rental fee of 10 cents a day.

The customer is given a free estimate of his heating requirements, and no charge is made for installation of the burner in his present furnace. At the end of the heating season the rentals previously paid may be applied on the purchase of the burner, and convenient terms arranged on the balance.

Keating at Oshkosh, Neb.

James E. Keating has been made manager of the North Central Gas Co., at Oshkosh. Neb., succeeding A. H. Ward, recently transferred to Riverton, Neb.

Valve Seats Renewed without Disturbing the Body of the Regulator



Fulton Low Pressure Regulator

THE Fulton Low Pressure Regulator can be fitted with new valve seats if desired, with the body of the regulator remaining undisturbed in the line. Plain directions will be mailed to any user on request. This regulator is capable of taking relatively high inlet pressures and reducing to the correct pressure for use. If the purpose is to deliver a very low pressure, the diaphragm surface is made very large so that the regulator becomes highly sensitive to any variation at the outlet and adjusts itself to compensate. Action is exact, positive and sure. Changes of pressure on the inlet side are therefore without effect on the delivered pressure. If gas supply should fail, automatic cut-off is provided. This Regulator is easy to install, never sticks, gives unfailing satisfaction. One of a line of regulators for all needs of gas control which has been known and approved for forty years. Catalog on request.

The Chaplin-Fulton Mfg. Company

28-40 Penn Avenue **Pittsburgh, Pa.**

REPRESENTATIVES

WESTCOTT & GREIS, Inc.
Sales and Service
Dallas — Tulsa

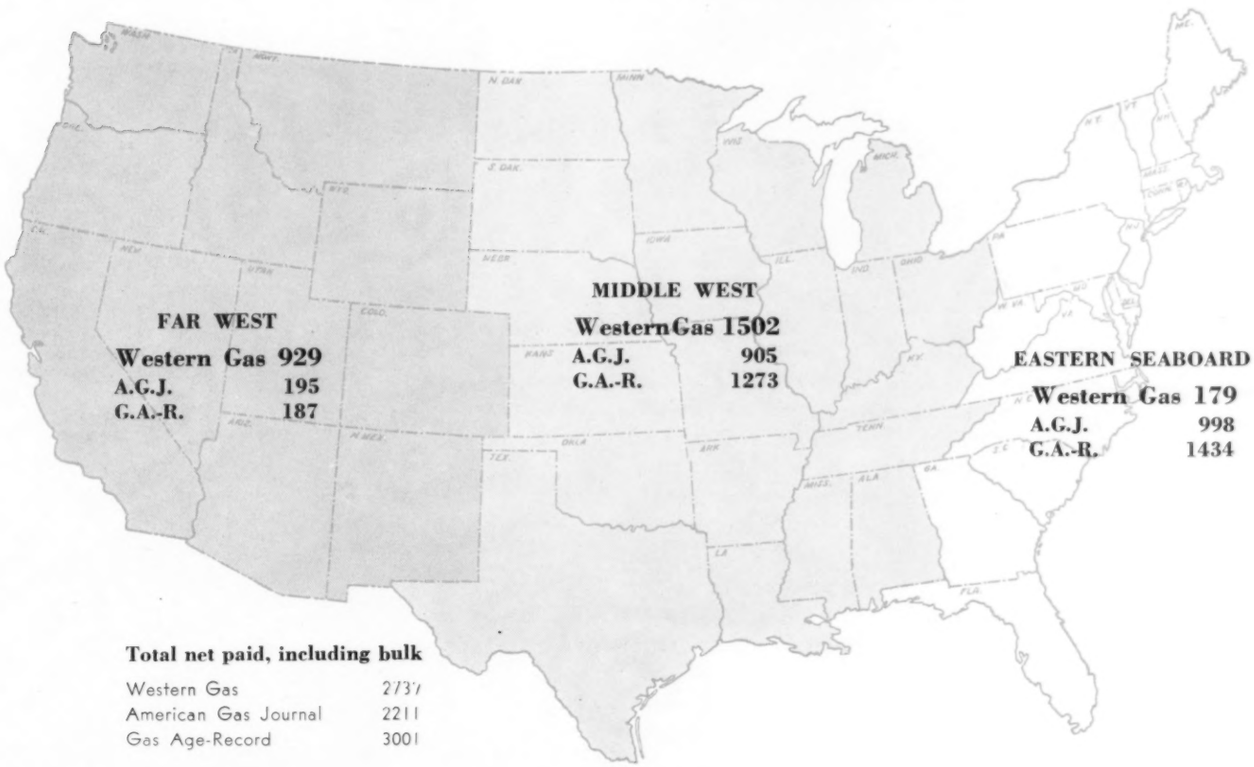
JNO. W. CRAWFORD
Sales Engineer
1855 Industrial Street, Los Angeles

PARSONS ENGINEERING CO.
Los Angeles, Calif. San Francisco, Calif.

OR ANY JOBBER

• At the Call of Natural Gas Men
WESTERN GAS Continues to March East!

[Figures on map denote number of paid subscribers served by each of the three gas industry publications in the three sections of the United States. Based on Publishers' Statements, six months period ending June 30th, 1934.]



Total net paid, including bulk

Western Gas	2737
American Gas Journal	2211
Gas Age-Record	3001

CIRCULATION COMPARISON—TWO YEAR PERIOD ENDING JUNE 30, 1934

Figures are based on a comparison of Total New Paid Averages for 6-Month periods.

	June 30, 1932 No. of Subsc.	Dec. 31, 1932 No. of Subsc.	June 30, 1933 No. of Subsc.	Dec. 31, 1933 No. of Subsc.	June 30, 1934 No. of Subsc.	No. of Subsc. Lost 2 Yr. Period	Percentage of Loss
Western Gas	3088	2740	2800	2703	2739	349	11.31%
American Gas Journal	2829	2649	2447	2168	2211	618	21.13%
Gas Age-Record	4286	3676	3306	3086	3001	1285	30.21%

WESTERN GAS

1064 Peoples Gas Bldg., Chicago — 810 South Spring Street, Los Angeles

INSPECTED INSIDE TOO

Three years ago, Republic introduced Electric Weld Casing and Tubing. Sales progress at first was slow. Buyers were justifiably sceptical. They asked for facts, and we gave them. We made no attempt to hide the fact that this product was welded. On the contrary, we made sales capital by proving the weld 100% perfect. We showed that only by the Republic Electric Resistance Welding Process could pipe be made commercially that possessed the attributes of straightness, roundness, and uniformity of wall thickness, strength and size. We played up the fact that, because it was made from clean strip steel and formed cold, it was entirely free from scale. And today, *there is no other method of making oil country casing or tubing that produces a product so definitely free from inside defects,* and known to be so, because the inside surface of every length is inspected as it is formed, right up to the point of welding.

Split a length of pipe produced by *any* hot-rolled process, compare the inside with Republic Electric Weld, and draw your own conclusions.

Records show that nine and one-half million feet of Republic Electric Weld Casing and Tubing has been set by leading producers in all fields during the last three years.

May we send you additional facts?

REPUBLIC
ELECTRIC WELD
CASING AND TUBING

REPUBLIC STEEL CORPORATION
GENERAL OFFICES YOUNGSTOWN, OHIO